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Research Product 81-12

DESIGN INSTITUTIONAL AND UNIT SUSTAINMENT  
TRAINING PROGRAMS FOR XM1 ARMOR CREWMAN

ARI FIELD UNIT AT FORT KNOX, KENTUCKY

January 1981

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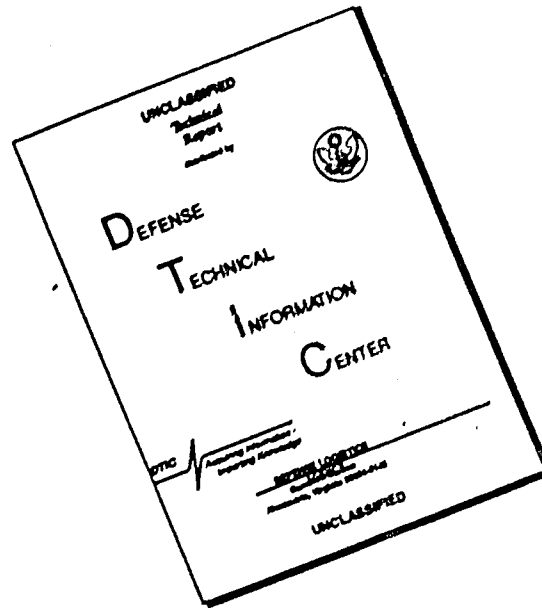
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DESIGN INSTITUTIONAL AND UNIT SUSTAINMENT  
TRAINING PROGRAMS FOR XMI ARMOR CREWMEN

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## FOREWORD

The Fort Knox Field Unit of the Army Research Institute for the Behavioral and Social Sciences (ARI) carries out research and exploratory development in the area of Armor training. An objective of this work is to develop, through analytic and field research, tank crew and individual training methods that are effective and efficient.

The project of which this report is a part was conducted by personnel of the Human Resources Research Organization (HumRRO) under Contract No. MDA 903-80-C-0223 and monitored by David W. Bessemer. The research was done under ARI FY 79 Work Program, Army Project 2Q762722A764, Training and Education, Task G: Collective Training Concepts in Armor Weapon Systems/Units, Work Unit 3: Simulation Training Capabilities and ARI FY 79 Work Program, Army Project 2Q763743A773, Training Management Systems, Task E: Armor Training Structures, Work Unit 3: Design of Simulation Training Components. The work is responsive to requirements of the U. S. Army Armor School at Fort Knox and the Army Training and Doctrine Command.

  
JOSEPH ZEIDNER  
Technical Director



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## BRIEF

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### Requirement

In an effort to reduce the costs and increase the efficiency of initial and sustainment training for XM1 armor crewmen, the Army is exploring the use of simulators for driving and tank gunnery. Based on the outcome of transfer and validity studies, recommendations may be made concerning the use of devices for initial and sustainment training. But the assessment of transfer is limited to the tasks for which the devices claim capability. A related assessment would address capability from the other side, from the domain of XM1 armor crewman tasks. That is, given a list of tasks (driving and gunnery) that make up the armor crewman's job, can the tasks be trained on the devices? For such a capabilities analysis, the approach is rational, comparing the device characteristics to task requirements, rather than empirical as in the transfer studies.

The results of the validity studies and the rational capabilities analysis will indicate which tasks the devices may be used for in initial and sustainment training. Assuming that the devices are adopted, the manner in which training on the devices and training that is not feasible on the devices and training that is not feasible on the devices are to be conducted must be determined.

### Procedure

To design institutional training for XM1 driving and gunnery, and unit sustainment training for XM1 gunnery, a capabilities analysis for each device (U-COFT and DT) was done and the training programs prepared based on the analyses.

Capabilities Analyses. The capability of each device (U-COFT and DT) for use in training the tasks was determined in two ways. First, if the device literature prepared by the manufacturer claimed capability for a task, the device was judged capable. Second, if descriptions of the device physical characteristics and hardware indicated that the device could be configured to train the task or portions of the task, the device was judged potentially capable.

Institutional Training. The program for XM1 armor crewmen was developed by selecting tasks to be trained in OSUT for driver, loader, gunner, and tank commander positions. Then, the training mode (e.g., hands-on device or XM1 tank) for each task was recommended. Next, a sequence for training the tasks in OSUT was suggested. Finally, driving and gunnery exercises for OSUT were recommended.

Sustainment Gunnery Training. The strategy for unit gunnery comprises three phases:

- Phase 1: Review OSUT gunnery material.
- Phase 2: Conduct sustainment gunnery training.
- Phase 3: Conduct XM1 gunnery exercises.

The strategy is based on the assumptions that soldiers entering the unit have been through Armor OSUT and followed the recommended institutional

training program. At the unit, refreshment and advanced development of existing gunnery skills is emphasized. That is, training is concerned less with individual gunnery skills and more with the coordination of these skills into the behaviors which contribute to proficient tank gunnery.

#### Findings

Three products were prepared:

1. Capabilities analyses for XM1 armor crewmen training devices.
2. Recommended training program for XM1 armor crewman institutional training.
3. Recommended unit sustainment training program for XM1 gunnery.

Each of these products is presented in the research product as a separate chapter with respective appendix(es).

#### Use of Findings

The three products taken together form the basis for XM1 training in both the institutional and unit settings.



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## CHAPTER ONE

### INTRODUCTION

In an effort to reduce the costs and increase the efficiency of initial and sustainment training for XM1 armor crewmen, the Army is exploring the use of simulators for driving and tank gunnery. Assessment of transfer of training to operational equipment and estimation of the predictive validity of proficiency on a simulator are addressed empirically by the Army's operational testing system for device evaluation. Based on the outcome of transfer and validity studies, recommendations may be made concerning the use of devices for initial and sustainment training.

Two training devices are being examined for possible introduction into the Army's program for training on the XM1 tank: the Driver Trainer (DT) for driving tasks, and the Unit-Conduct of Fire Trainer (U-COFT) for gunner tasks for the gunner and tank commander. Both devices are to be evaluated in the second Operational Test (OT II) for training transfer and predictive validity. But the assessment of transfer is limited to the tasks for which the devices claim capability. A related assessment would address capability from the other side, from the domain of XM1 armor crewman tasks. That is, given a list of tasks (driving and gunnery) that make up the armor crewman's job, are the devices capable of training those tasks? Do the devices possess the physical characteristics and hardware to enable them to be configured to present initiating stimuli and system responses for the tasks? For such a capabilities analysis, the approach is rational, comparing the device characteristics to task requirements, rather than empirical as in OT II.

The results of OT II and the rational capabilities analysis will indicate which tasks the devices may be used for in initial and sustainment training. Assuming that the devices are adopted, the manner in which training on the devices and training that is not feasible on the devices are to be conducted must be determined.

↙ The purpose of this report is to present the products prepared in response to the Task 1 and Task 2 requirements for Mission-Based Simulation and Training Requirements (Contract No. MDA 903-80-C-0223) to design institutional training for XM1 driving and gunnery, and unit sustainment training for XM1 gunnery. Specifically, three products are presented:

- Capabilities analyses for XM1 armor crewman training devices.
- Recommended training program for XM1 armor crewman institutional training.
- Recommended unit sustainment training program for XM1 gunnery. ↘

## CHAPTER TWO

### CAPABILITIES ANALYSES FOR XM1 ARMOR CREWMAN TRAINING DEVICES

The capabilities analyses for driver tasks on the Driver Trainer and for gunner tasks on the U-COFT began with comprehensive task lists for the two positions. The task lists were derived from the Operator's Manual for the XM1 tank (TM 9-2350-255-10), from the sections on the Driver's Station, Gunner's Station, Unusual Conditions, Emergency Procedures, Troubleshooting, and Maintenance.

The capability of each device for use in training the tasks was determined in two ways. First, if the device literature prepared by the manufacturer claimed capability for a task, the device was judged capable. The verification of such claims will rest on the results of the transfer studies in OT 11. Second, if descriptions of the device physical characteristics and hardware indicated that the device could be configured to train the task or portions of the task, the device was judged potentially capable for the task or portion thereof.

The device literature consulted for the Driver Trainer was:

- Specification for XM1 Tank Driver Trainer Device A17B13. Naval Training Equipment Center, Orlando, Florida, 10 April 1979.
- XM1 Tank Driver Trainer Device A17B13, Trainer Engineering Design Report (Final), Revision A, Volumes 2-4 (Appendixes C and D). Sperry Secor Simulation Systems, January 1980.

For the Unit-Conduct of Fire Trainer, two manufacturers' devices are still in the evaluation process. Literature from both was consulted:

- Configuration Item Development Specification for XM1 Unit-Conduct of Fire Trainer Device A17B14. Defense Engineering Division, Chrysler Corporation, 1 March 1980.
- Configuration Item Development Specification (Preliminary) for Unit-Conduct of Fire Trainer, XM1/M60 COFT A17B14. Simulation and Control Systems Department, Electronic Systems Division, General Electric Company, 29 February 1980.

The resulting capabilities for the DT and U-COFT are presented as Appendixes A and B, respectively. Tasks are grouped by functional area, and the page number on which they appear in TM 9-2350-255-10 is also given. For the DT, the number assigned to the procedure, driving program, and/or malfunction corresponding to the task (according to the device literature) is given. The U-COFT literature did not include program details or procedure numbers.

The capabilities analyses include judgments at the task step level. The decisions are based on device physical and hardware characteristics, and represent potential capability, pending software development, as well as claimed capability.

The constraints that determined the potential capabilities decision for the DT are:

- The UP/DOWN lever on the Driver's seat will not change the seat position.
- The hatch controls work except that the hatch remains closed.
- There are no cables or wires visible in the driver's station.
- The driver cannot remove and replace burned out lamps on his panels.
- No heated air is provided for the personnel heater and gas particulate filter system.
- The portable fire extinguisher is provided in mockup form (non-functional).
- The periscope washer pump and reservoir are non-functional.
- The loader, gunner, and tank commander actions and responses must be simulated by the device or by the instructor.
- No tasks outside the driver's station can be simulated on the device.

For the two U-COFTs, the constraints were:

- The turret traverse and elevation travel locks are not provided (GE).
- Hydraulic pressure has a permanent reading of 1600 psi (GE).

- The intercom switch is permanently set to ALL (GE).
- The crosswind sensor has a permanent sensing of 10 mph (GE).
- No coax machinegun is provided beyond the simulated charging handle (GE).
- No coax machinegun ammunition is provided, nor could the coax be loaded.
- No loader's hatch is provided.
- No heated air is provided for the personnel heater and gas particulate filter system.
- The gunner cannot remove and replace burned out lamps on his panels.
- The turret networks box is not provided.
- There are no cables or wires visible in the gunner's station.
- There is no firing circuit tester, nor breechblock or gun tube in which to use the tester.
- Loader actions and responses must be simulated by the device, instructor, or tank commander; driver actions and responses must be simulated by the device or instructor; tank commander actions and responses must be provided by the acting tank commander.
- No tasks outside the gunner's station can be simulated on the device.

## CHAPTER THREE

### RECOMMENDED TRAINING PROGRAM FOR XM1 ARMOR CREWMAN INSTITUTIONAL TRAINING

The initial training for the XM1 Armor Crewman (MOS 19K) is structured as One Station Unit Training (OSUT). During his 13 weeks in OSUT, the soldier receives training in common task areas such as communications, first aid, and personal weapons, as well as in tasks specific to the XM1 tank. When the soldier completes OSUT, his assignment is most likely to be as an XM1 tank driver, although occasionally he will immediately fill a loader or gunner slot. Therefore, the XM1 tank specific training in OSUT is designed to produce a soldier who is a certified driver, qualified loader, and familiarized gunner and tank commander.

The purpose of this paper is to recommend tasks to be trained in OSUT for driver, loader, gunner, and tank commander positions, to recommend the training mode (e.g., hands-on device or XM1 tank, on the job) for each task, to recommend a sequence for training the tasks in OSUT, and to recommend driving and gunnery exercises for OSUT. The result is a Program of Instruction (POI) for XM1 Armor Crewmen.

#### Task Selection

A preliminary OSUT task list for XM1 tasks was derived from a document entitled "Tasks Selected for Training, MOS K10-40, XM1 Armor Crewman" (80-5-28/220, 2/6 [DH]). This document includes tasks for resident and extension training, as well as tasks not selected for training, for skill levels one through four, and covers tasks in such areas as ammunition, communications, and general maintenance as well as XM1 specific tasks. The OSUT task list for the XM1 includes tasks for skill level one, selected for resident training, for XM1 specific tasks.



This tentative training task list was compared to comprehensive task lists derived from the XM1 Tank Operator's Manual, TM 9-2350-255-10. In this way, the scope of each task was more clearly defined. For example, the driver task, Start/Stop Engine of an XM1 Tank, includes preparing the driver's station for operation, starting the engine, making after start checks, shutting down the engine, and powering down the driver's station. This comparison also permitted identification of XM1 tasks that appear in the Operator's Manual but were not listed for resident training, or were not deemed appropriate for training at skill level one.

#### Training Mode

Earlier work in examining the capabilities of the two devices (DT and U-COFT) compared their advertised capabilities and hardware and software characteristics to the system requirements for performance of driver and gunner tasks as given in the Operator's Manual. The resulting capabilities analyses, described in Chapter Two, delineate the tasks that may or may not be trained on the devices (contingent upon outcome of the operational tests).

For the DT, it was possible to distinguish two levels of capability. For many tasks, the DT literature claims capability for training; those claims were to be tested during OT II. For other tasks, the DT was judged potentially capable; that is, there were no physical characteristics of the device that precluded its use for training the tasks (or major or skilled portions of the tasks). Only software expansion would be required.

The U-COFT literature provided by the manufacturers was not sufficiently detailed to permit examination of specific device programs, as had been done for the DT. Instead, the analysis could distinguish only which tasks

(or major or skilled portions) could be trained on the U-COFT if the software were designed and which could not, given the physical constraints and hardware characteristics of the device.

The comparisons between the tentative task list and the Operator's Manual and between the Operator's Manual and device capabilities were then brought together into a single analysis with results as shown in Appendix C. It contains the tentative OSUT tasks for the XM1, the corresponding procedures as found in the Operator's Manual or device literature, and an indication of whether or not each procedure is trainable on the DT or U-COFT. (For the DT, an (X) indicates potentially trainable, as defined earlier.) It also contains a listing of tasks not contained in the tentative list but which appear in the Operator's Manual for the driver, loader, and gunner. For the most part, such tasks cover emergency and troubleshooting procedures, tasks which may be considered enabling skills, and a few tasks which seem to have been omitted from the tentative list for no reason other than simple oversight. Because OSUT is intended only as familiarization training for tank commander tasks, a list of tank commander tasks that appear in the Operator's Manual but not on the tentative list was not prepared.

The tasks that remain are those for which it was determined device training was not possible. These procedures were classified into three groupings: those that should be trained during OSUT by means of scheduled formal demonstrations (marked X-D in the XM1 column), those that should be trained in OSUT only if the need arises (marked X-N in the XM1 column), and those that would best be trained in the soldier's assigned unit rather than in OSUT (marked X in the Field column). Several considerations guided the classification process:

- . Procedures to be trained in formal scheduled sessions are those which the soldier should be familiar with before he is assigned to a unit. Training only as the need arises is not feasible, either because of the quick reaction needed (such as operating the portable fire extinguisher), or because the conditions requiring performance are unlikely to occur and cannot be induced or simulated (such as most troubleshooting tasks). These are for the most part one-man tasks

and/or require quick reaction time. Most of the loader routines are marked for scheduled demonstrations simply because they must be formally trained on the XM1 before the soldiers are required to perform them during OSUT field exercises.

- . Procedures to be trained only as the need arises include tasks which are performed by more than one crewman working together, and/or which do not require a quick reaction time. If the conditions do not occur during OSUT, the task may be trained in the unit when the need arises with no harmful consequences. For many of these tasks, however, the conditions are very likely to occur; for those less likely to be required, the tasks are marked with both X-N in the XM1 column, and X in the Field column.
- . Procedures which are not recommended for OSUT are those that are amenable to on the job training, and for which conditions very likely will not occur in OSUT. Additionally, tasks which were destined for extension training or for skill level three personnel are also marked X in the Field column, indicating non-OSUT training.

Examination of the task list in Appendix C and the potential for device training for each task suggested several considerations for structuring OSUT. First of all, if a device is shown during OT II to be an effective and valid medium for training a task, then it should be used, as configured by the manufacturer, for the task. If the device exhibits only partial effectiveness in training a task, then follow-up training for the task in another training mode should be provided. Device training should be abandoned only when it demonstrates negative or no transfer to task performance on the XM1 tank during OT II.

Second, of the 48 driver tasks which were judged potentially trainable on the DT, 41 were troubleshooting procedures for which the corrective actions in the driver's station involved only steps which were required by tasks that were already included in the DT software, such as checking circuit breakers. It is a reasonable assumption, then, that if the DT demonstrates training effectiveness and transfer for the troubleshooting tasks for which it is programmed, it will also be valid for training these 41 other troubleshooting procedures.

The recommendations for OSUT tasks therefore include these troubleshooting procedures as DT-trainable.

The remaining seven driver tasks that are marked (X), indicating that they were judged suitable for DT training, would require considerable device programming; four of the seven (Slave Start Tank, Operate Tank on Snow or Ice, Operate Tank on Sand or Mud, and Ford Shallow Water) would also require design of visual scenes in addition to audio cues and responses. If the software were configured to represent these seven tasks, the programs should be subjected to operational testing before being included in the list of DT-trainable tasks. However, the additional device development for these 48 tasks and operational testing for seven of the tasks is recommended in view of the high initial cost of the device and the relatively low cost of expanding its capabilities--that is, the device should be exploited to the full extent of its potential. Furthermore, it is undoubtedly easier and more reliable to introduce the task initiating stimuli (e.g., component malfunction, dead tank, snow or ice) on a simulation device than on an operational XM1 tank or in the field.

Third, although few tank commander tasks appear in the tentative task list, it may in fact be more efficient to train a larger portion of the commander's job, because of the U-COFT design. The device is a two-person trainer: the gunner and tank commander trainees are put through their paces simultaneously. Either an OSUT instructor or another OSUT soldier has to play the tank commander while the gunner procedures are trained. Therefore, it makes sense for trainees to learn both crewmen's jobs, so far as they are taught on the U-COFT. To do otherwise would require an additional instructor to train the same number of soldiers, and the amount of training provided would be less (gunner only, rather than gunner and tank commander). No additional materials are required, since the U-COFT already provides the tank commander procedures.

Based on these considerations, and assuming OT II results indicate that the DT and U-COFT are cost-effective training modes, it is recommended that the devices be used for training as many of the driver, gunner, and

tank commander procedures as possible. The devices should be used in the manner in which the manufacturers have designed them; that is, the task sequence and trainee progression recommendations programmed into the devices should be followed. For the DT, that sequence is shown in Appendix D. The procedures which are to be added to the existing software are also indicated. U-COFT literature was not sufficiently detailed to permit preparation of a similar list.

The tasks marked X-D in the XM1 column of Appendix C, indicating that they are to be trained by means of formal, scheduled training sessions on an XM1 tank are listed in Figure 1. They are divided into six groups for the four crew position stations, the preventive maintenance procedures, and other tasks which are crewmember non-specific. These are the tasks for which training materials must be developed.

#### Sequence and Scheduling

Because both devices include familiarization routines, it was determined that device training for the driver, gunner, and tank commander tasks should be conducted before the soldier begins training on the XM1 for the same crew position. Preventive maintenance procedures should also be trained before driver, loader, and gunner procedures on the tank, simply because the maintenance checks should be done whenever the XM1 tank is to be powered up. None of the tank commander tasks to be trained on the XM1 require that preventive maintenance checks be done first. In general, the recommended prerequisites are shown in Figure 2.

According to DT literature, the twelve procedures programs and seven driving programs average eight and twelve minutes, respectively, for a total of 180 minutes required to attempt every procedure one time. The 48 task procedures discussed earlier are expected to require an additional 35 minutes, based on their probable complexity as compared to that of existing procedures. Allowing for two iterations of each procedure program and three iterations of each driving program would require slightly over eight hours of training time. Therefore, two days have been allocated for DT training. This should be sufficient to provide practice to mastery on all procedures.

#### Driver

- Enter Driver's Station
- Clean Periscope Lenses
- Service Periscope Washer Fluid Reservoir
- Exit Driver's Station
- Unlock Stuck Parking Brakes

#### Loader

- Prepare Loader's Station for Operation (includes Loader's Station Preventive Maintenance Checks and Services)
- Operate Periscope, Remove/Install Periscope, Clean Periscope Lenses
- Operate Elevation Travel Lock
- Operate Turret Traverse Lock, Troubleshoot Turret Lock
- Operate Loader's Panel, Troubleshoot Loader's and Gunner's Indicator Lights
- Operate Gas Particulate Filter System, Troubleshoot Gas Particulate Filter System
- Perform Pre/Post Firing Checks
- Secure Loader's Station
- Stow Ammunition, Troubleshoot Ammunition Compartments
- Operate Breechblock, Perform Operator Maintenance on Breechblock
- Load/Unload Grenade Launcher, Troubleshoot Grenade Launcher, Prepare Grenade Launcher for Travel
- Operate Main Gun, Troubleshoot Main Gun
- Operate Loader's Machinegun
- Prepare Weapons for Travel: Main Gun, Coax, Loader's Machinegun

#### Gunner

- Enter Gunner's Station
- Perform Firing Circuit Checks
- Perform Hydraulic Zero Pressure Check
- Operate Coax
- Troubleshoot Indicator Lights
- Troubleshoot Fire Control System
- Troubleshoot Main Gun
- Exit Gunner's Station

#### Tank Commander

- Operate Cal .50 Machinegun
- Prepare Cal .50 Machinegun for Travel

#### Preventive Maintenance Checks and Services (PMCS)

- Perform PMCS on Vehicle
- Perform PMCS on Hull
- Perform PMCS on Hull Rear
- Perform PMCS on Turret

#### Other

- Extinguish Fire Using Portable Extinguisher, Extinguish Fire Using External Extinguisher Handles
- Decommission Tank
- Install Water Fording Kit Items, Prepare Tank for Operation After Fording
- Use Infrared Lenses
- Lubricate Tank
- Service Precleaner and Air Cleaner Filters

Figure 1. OSUT tasks for which formal training on an XM1 tank is recommended (Cont'd.).

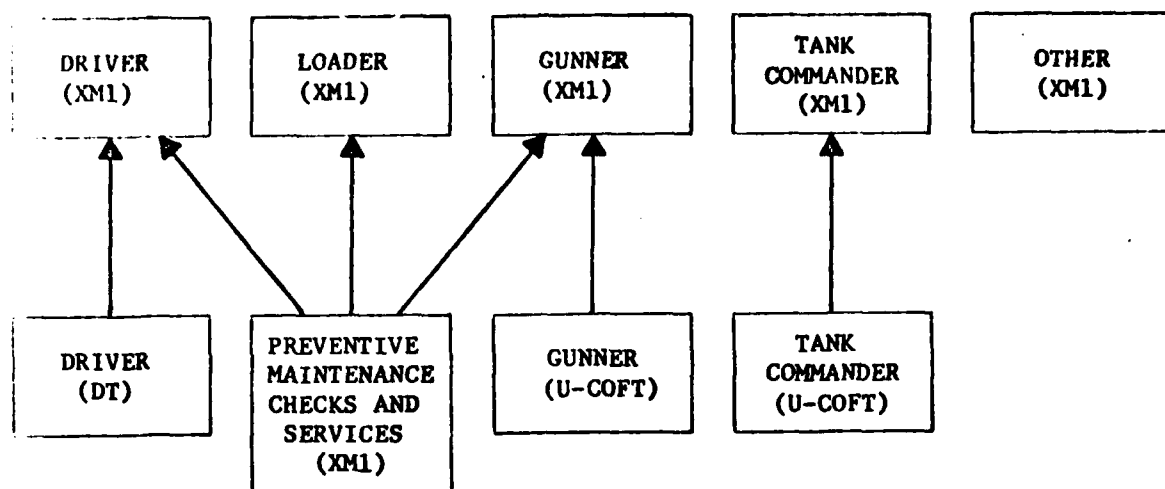


Figure 2. Structure of Training Prerequisites for OSUT.

The U-COFT information provided to date indicates that all programmed procedures are estimated to be trainable, including replications, within four days each for gunner and tank commander. Thus a total of eight days is allocated to U-COFT training, with each soldier spending four days in the gunner's station and four days in the tank commander's station.

Estimates of time required for on-tank training are based primarily on the number and complexity of the procedures to be covered in each of the six groups (see Figure 1). The times allocated are one day for preventive maintenance checks and services, one day for driver procedures, three days for loader procedures, one day for gunner procedures, one day for tank commander procedures, and one day for XM1 "other" procedures.

Most of the XM1 procedures may be trained and practiced in the tank park, if room is provided for traversing the turret. However, driving and gunnery training and practice will require that XM1 tanks be taken out on the ranges. It is therefore recommended that soldiers proceed through the XM1 portion of OSUT in blocks of four. Soldiers should rotate through the four crew positions during driving and gunnery exercises. Times given above are adequate to allow practice of all procedures by each soldier in a block.

The training schedule in Figure 3 provides the breakout of the 18 days of training on the devices and the XM1 (driving and gunnery exercises are not included). Two blocks of four soldiers each may be accommodated by one DT (can handle up to five soldiers at once, requires two instructors), two U-COFT (each can handle one gunner and one tank commander at a time, and requires one instructor), and two XM1 tanks (each to accommodate four soldiers and one instructor). The schedule also indicates where any required training to supplement DT and U-COFT procedures should be provided. If such training is inserted, however, the subsequent days assigned for training should be adjusted accordingly.



DAY	BLOCK 1 (4 SOLDIERS)		BLOCK 2 (4 SOLDIERS)	
1	Driver Procedures (DT)		(2 Soldiers)	(2 Soldiers)
2			Gunner Procedures (U-COFT)	Commander Procedures (U-COFT)
3				
4				
	Preventive Maintenance Checks and Services			
	Driver Procedures (XM1) [DT Supplemental Training]			
5	Loader Procedures (XM1)		Commander Procedures (U-COFT)	Gunner Procedures (U-COFT)
6				
7				
8				
	Other Procedures (XM1)			
9	(2 Soldiers)	(2 Soldiers)	Preventive Maintenance Checks and Services	
10	Gunner Procedures (U-COFT)	Commander Procedures (U-COFT)	Gunner Procedures (XM1) [U-COFT Supplemental Training]	
11			Commander Procedures (U-COFT)	
12			Driver Procedures (DT)	
13	Commander Procedures (U-COFT)	Gunner Procedures (U-COFT)	Driver Procedures (XM1) [DT Supplemental Training]	
14			Loader Procedures (XM1)	
15				
16				
17	Gunner Procedures (XM1) [U-COFT Supplemental Training]			
18	Commander Procedures (U-COFT)		Other Procedures (XM1)	

Figure 3. Proposed OSUT Schedule for XM1 Task Training.

### Driving and Gunnery Exercises

In addition to the procedures to be trained on the XM1 tank (Figure 1), soldiers should also be given training and practice in tactical driving and gunnery on the XM1 tank during OSUT. The April 1979 Program of Instruction (POI) for M48/M60A1 tank drivers (MOS 19F) specified 109 hours of tactical driving training, beyond the procedures selected for XM1 training as listed in Appendix C, as follows:

- . Tactical Driving Class (1 hour conference)-- characteristics of firing positions, use of terrain for cover and concealment.
- . Tactical Driving (1/2 hour conference, 23 1/2 hours practical exercise)--movement of the tank so it is not exposed for more than 15 seconds, during daylight and darkness and in an NBC environment; selection and occupation of best available firing position.
- . Tactical Driving in Gunnery Exercises (Advanced Gunnery Driving) (2 hours conference, 82 hours practical exercise)--gunnery driving techniques for multiple engagement and variable sequenced targets for Tank Table VIIC<sup>1</sup>. (Also assist in setting up ranges for tank table firing, assist and observe in range operations including range guard, radio operations, and police.)

The April 1979 POI for M48/M60A1 armor crewmen (MOS 19E) specified 173 hours of gunnery exercise, beyond the tasks selected for training as listed in Appendix C, as follows:

- . Laser Exercises (Day) (1 hour conference, 7 hours practical exercise) and Laser Exercises (Night) (5 hours practical exercise)--fire Tank Tables I, II, and III with laser device, day and night: engage stationary targets from stationary vehicle to include manipulation of controls and range card exercises, and engage moving, variable speed targets by tracking, leading, and adjusting fire.
- . Subcaliber Firing (2 hours conference, 30 hours practical exercise)--fire modified Tank Table IV with subcaliber device: acquire, identify and engage stationary targets.

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<sup>1</sup>Tank Tables I through VII are given in FM 17-12, Tank Gunnery, March 1977.

- . Non-Fire Gunnery Exercise (2 hours conference, 30 hours practical exercise)--traverse and search, react to fire commands, engage simulated targets, place tank in hull down position during tactical movement exercise.
- . Main Gun Firing (2 hours conference, 30 hours practical exercise)--fire modified Tank Table VI, day and night: engage moving and stationary targets using battlesight and precision fire.
- . Advanced Gunnery Exercise (4 hours conference, 60 hours practical exercise)--fire modified Tank Table VII with subcaliber device, day and night: engage stationary and moving targets from moving vehicle.

The DT is not expected to significantly reduce the time required to practice to mastery level the elements of tactical driving, although it should be effective in providing the enabling skills required to operate the XM1 tank. The U-COFT, however, should provide sufficient simulated firing practice that tank crews will be able to achieve current mastery levels in gunnery in considerably less than the 173 hours scheduled in the 19E POI, and also less than the 162 hours of practical exercise specified. At the same time, it is obvious that, other things being equal, the more practice time provided to soldiers, the more proficient they will be.

The POI for 19E armor crewman and 19F driver OSUT were compared to the full list of tasks tentatively selected for 19K OSUT to determine the time that would be required for the non-XM1 parts of 19K OSUT. By using the hour allocations in the two POI for all tasks that appeared on the 19K task list for skill level one resident training, and for basic training subjects such as military justice and wearing of the uniform, the following general allocations of time were made:

- . Fundamentals of the Soldier, Combat Skills and Tactics, and Weapons (taught by Committee Group)--76 hours.
- . Weapons and Communications (taught by Training Brigade)--42 hours.
- . Fundamentals of the Soldier, Combat Skills and Tactics, Physical Readiness Training, and Testing and Reinforcement Training (taught by Training Brigade)--147 hours.
- . XM1 Armor Crewman Training (as described earlier)--144 hours.

These subjects require 409 hours altogether. Nonacademic subjects (inprocessing, outprocessing, and Commandant's time) will require an additional 86 hours. Both the 19E and 19F POI included 101 hours of instruction during after duty hours, for exercises to be performed at night. If the 19K OSUT is allowed 13 weeks, as were 19E and 19F OSUT, then 126 hours (including 101 after duty hours) may be given over to driving and gunnery exercises.

#### Program of Instruction for 19K10-OSUT XML Armor Crewman Course

Taking all these parameters and conditions into account, a Program of Instruction for 19K10-OSUT Armor Crewman Course was prepared (see Appendix E). One major difference between this POI and the POI for the 19E and 19F OSUT is in the absence of a section on concurrent training in the 19K OSUT. Because soldiers will proceed through OSUT in blocks of four in all subjects taught by the Training Brigade, there will be no significant down time during which concurrent training could or should be provided. All subjects formerly covered in concurrent training have been incorporated into the formal training.

All units involving practical exercise except the Driving Exercise and Gunnery Exercise units are to be conducted according to principles of performance-oriented instruction. A summary of those principles is presented at Appendix F. The Driving Exercise unit will include instruction in tactics as well as application of the instruction by means of actual driving. The Gunnery Exercise unit will require soldiers to alternate in the four crew positions during XML Crew Drills and Crew Subcaliber Exercises.<sup>1</sup>

Those units of instruction which cover basic soldiering areas contained in Annex A and Subannexes B4 through B8, were for the most part lifted directly from the 19E and 19F POI. The ammunition requirements for these units were also taken from the 19E and 19F POI. Ammunition requirements for the Gunnery Exercise unit are based on requirements for Crew Subcaliber Exercises.

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<sup>1</sup>Crew Drills are given in TC 17-15-14 (Draft), Crew Drills XML Main Battle Tank, September 1980. Crew Subcaliber Exercises are given in FM 17-12-1 (Draft), Tank Gunnery for XML Main Battle Tank, September 1980.

## CHAPTER FOUR

### RECOMMENDED UNIT SUSTAINMENT TRAINING PROGRAM FOR XM1 GUNNERY

This training incorporates the XM1 U-COFT, as well as subcaliber and main gun fire on the XM1, and provides for year round instruction (within the confines of the three-week cycle of training, maintenance, support). The sustainment program is a logical extension of the training given in OSUT where the emphasis is on the initial acquisition and development of gunnery skills. The sustainment strategy, as presented here, emphasizes the refreshment and advanced development of existing gunnery skills. That is, the training is concerned less with individual gunnery skills and more with the coordination of these skills into the behaviors which contribute to proficient tank gunnery. The strategy for unit gunnery is planned in three phases:

Phase 1: Review OSUT gunnery material.

Phase 2: Conduct sustainment gunnery training.

Phase 3: Conduct XM1 gunnery exercises.

Each of these phases is discussed in turn below.

#### Review OSUT Gunnery Material

The training strategy is based on the assumptions that soldiers entering the unit have been through Armor OSUT and followed the training program recommended in Chapter Two. Their readiness to proceed to sustainment training can be determined by administering an end-of-OSUT performance test to each soldier as he enters the unit. Only the U-COFT gunnery portion of the end-of-OSUT test needs to be administered; in this manner, remediation becomes a relatively simple matter of following the program provided by the device manufacturer.<sup>1</sup> Essentially, if a soldier fails to meet the standard on part of the readiness pre-test that will assess mastery of U-COFT gunnery tasks addressed in OSUT, then the recommendation is to remediate on the spot using, in effect, one-on-one performance training.

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<sup>1</sup> Much of the information pertaining to either or both U-COFT remains proprietary in nature. As such, it cannot be duplicated, disclosed, or used except with permission of the respective contractor. Nothing proprietary in nature is contained in this memorandum.

The test need cover only gunnery objectives which indicate soldiers' ability to:

1. Detect stationary and moving targets.
2. Identify stationary and moving targets.
3. Issue fire commands (initial and subsequent).
4. Respond to fire commands (initial and subsequent).
5. Engage and destroy (or neutralize) stationary and moving targets with main gun, coaxial machinegun, and caliber .50 machinegun [under all light and visibility conditions and with fully operational and degraded fire control systems.]

A set of gunnery objectives selected to measure these abilities and available for "re-call" on the U-COFT, is at Appendix G. The objectives were derived for and described in an earlier document (Campbell, Harris, Bessemer, 1980); however, a brief review of the material seems helpful here.

The domain of XM1 tank gunnery engagements can be broken into discrete categories. Each category is broadly defined as a combination of the levels of six conditions:

1. Fire Control Mode - Normal, Emergency, or Manual.
2. Method of Engagement - Precision or Battlesight.
3. Laser Rangefinder - Operative or Inoperative.
4. Gunner's Primary Sight Reticle - Operative or Inoperative.
5. Thermal Imaging System - Operative or Inoperative.
6. Lead Angle Sensor - Operative or Inoperative.

After deleting combinations that are not rational, and combining into single categories combinations that have identical impact on gunnery, 31 categories remain. The 31 engagement categories and the combinations of condition levels that define each are presented in Table 1. The gunnery objectives in Appendix G were derived from these 31 engagement categories.

On each gunnery objective, the possible status of conditions for own tank and target are given by a + in the appropriate condition level.<sup>1</sup> These conditions are those that can be evaluator/operator controlled on the U-COFT. Indicated malfunction(s) must be introduced

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<sup>1</sup>Gunnery with the .50 caliber machinegun is included although the conditions (excluding target range) have no impact on .50 caliber gunnery.

TABLE 1  
XMI TANK GUNNERY  
ENGAGEMENT CATEGORIES

Fire Control Mode	Fire Control System Failure							
	None	GPS Reticle	TIS	GPS Reticle & TIS	Lead Angle	GPS Reticle & Lead Angle	TIS & Lead Angle	GPS Reticle & TIS & Lead Angle
OPERATIVE LRF	<u>ENGAGEMENT NUMBER</u>							
NORMAL								
Precision	1	2	3	-	5	6	7	-
Battlesight	-	-	4	-	-	-	8	-
EMERGENCY								
Precision	-	-	-	-	9	10	11	12
Battlesight	-	-	-	-	-	-	13	14
MANUAL								
Precision	-	-	-	-	-	-	-	15
Battlesight	-	-	-	-	-	-	-	16
INOPERATIVE LRF								
NORMAL								
Precision	17	18	19	-	20	21	22	-
Battlesight	23	24	4	-	25	26	8	-
EMERGENCY								
Precision	-	-	-	-	27	28	29	12
Battlesight	-	-	-	-	30	31	13	14
MANUAL								
Precision	-	-	-	-	-	-	-	15
Battlesight	-	-	-	-	-	-	-	16

in such a way that the gunner and tank commander will be unaware until the malfunction occurs at the "real world" point in the engagement sequence. Included on the display for each objective are the scoring criteria for both live fire and dry fire. No time standards have been established; however, the events of interest between which times should be recorded are stated. An accuracy standard of a target hit (main gun) or target suppression (machinegun) within a cost standard of two main gun rounds or 25 machinegun rounds is recommended for each objective.

Once a soldier achieves mastery on the set of objectives, he may begin Phase 2 training.

#### Conduct Sustainment Gunnery Training

The sustainment gunnery training phase is to be conducted exclusively on the U-COFT and includes exercises in manipulation and advanced gunnery followed by an evaluation to determine readiness to proceed to the XML gunnery exercises. Because of the proprietary nature of U-COFT information, the remainder of this section discusses only briefly and generally the exercise and evaluation parts of the Phase 2 strategy.

Manipulation exercises provide review and further development of the hand-eye skills necessary to engage stationary and moving targets.

Advanced gunnery exercises build on the gunnery skills acquired in OSUT by progressing through a gunnery exercise sequence from single, stationary targets through multiple moving targets. This progression from "easier" to "more difficult" should be made through three levels. The first level exercises focus on stationary or "simple" moving target gunnery. The exercises in level two should contain multiple target moving gunnery while the third level emphasizes multiple, fast moving targets.



The evaluation determines whether the desired level of proficiency sustainment has been achieved so that soldiers may proceed to Phase 3 training. The gunnery exercises for the evaluation should be selected from among the advanced gunnery exercises. The standards prescribed by the U-COFT manufacturer for mastery of the evaluation exercises must be met before a soldier begins the XM1 gunnery exercises.

#### Conduct XM1 Gunnery Exercises

The XM1 gunnery exercises comprise three components<sup>1</sup>:

1. Crew drills.
2. Crew subcaliber exercises.
3. Main gun exercises.
  - a. Crew combat evaluation exercise (CCEE).
  - b. Platoon qualification exercise (PQE).

This approach to gunnery exercises allows tank crews to enter the program at demonstrated level of proficiency. For example, if a tank crew is still together from their last gunnery at a major training area, they would begin with subcaliber CCEE (component 3, above), rather than with crew drills in component 1. The variable entry program provides the commander more control of tank crew training in the unit. A brief discussion of the three exercise components follows:

The crew drills form the basis of not only crew drill, but also individual proficiency for tank gunnery. This latter characteristic provides essential transition to crew subcaliber exercises.

Crew subcaliber exercises are designed to train crews to engage multiple stationary and moving targets while exercising full crew interaction. Each exercise is divided into two scenarios, stationary (defensive) and moving (offensive). They are fired dry prior to subcaliber, quarterly at the local training area.

The crew combat evaluation exercise portion of main gun exercises evaluates a crews' ability to engage multiple stationary and moving targets, both within the offensive and defensive role. The crew must

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<sup>1</sup>Miller, SFC L.G., and Silva, SFC R.C., Jr. "Master Gunner's Corner", in Armor, September - October 1980. The material for this phase of the unit gunnery strategy is from the referenced article.

dry and subcaliber fire the CCEE prior to main gun firing. Deficiencies noted during subcaliber firing are corrected during subsequent subcaliber runs. The platoon qualification exercise incorporates fire control and distribution of fire with movement and teamwork to evaluate the platoon. The PQE is dry and subcaliber fired prior to main gun firing, just as required in the CCEE.

## REFERENCES

Campbell, C.H., Harris, J.H., and Bessemer, D.W. Training Materials and Data Requirements for Unit Conduct of Fire Trainer (U-COFT) Training Test Support Plan. Research Product, Human Resources Research Organization (HumRRO), August, 1980.

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APPENDIX A

CAPABILITIES ANALYSIS FOR  
DRIVER TASKS ON DRIVER TRAINER

## KEY

- TM Page, Task: In these two columns are the tasks for the driver as derived from TM 9-2350-255-10, and the page number on which they appear. The tasks have been grouped by functional area, for the most part.
- Procedure: This column contains the procedure, driving program, and/or malfunction number, as assigned by the manufacturer, which is claimed as a means for training the tasks. If no procedure has been provided for the task, a dash (-) appears in the column.
- Yes/No: In these two columns are task step designators, as found in TM 9-2350-255-10, which could or could not be performed on the device. The decision is based on device physical and hardware characteristics, and represents potential capability, pending software development, as well as actual capability. If a step is in the Yes column, it means that the device is or could be configured to present the initiating stimulus for the step and the system response resulting from the step.
- Cap[able]: An "X" in this column means that the device literature claims capability to train the task. An "(X)" means that the device could be configured to train the task; in some cases, where task steps have been listed in the No column, an "(X)" means that the skilled portion of the task could be represented. A "-" in this column means that the device is not equipped to present the initiating stimuli and/or system responses for the major or more skilled portions of the task.

CAPABILITIES ANALYSIS FOR  
DRIVER TASKS ON DRIVER TRAINER

TM PAGE	TASK	PROCEDURE	YES	NO	CAP
2-65	PREPARE STATION FOR OPERATION				
65	Enter driver's station	-	F-I	A-E	-
66	Power up hull systems	11	A-R		X
70	Operate domelight	11	A-D		X
70	Operate intercom	6,11	A-F		X
71	Open driver's hatch	16	A-F <sup>1</sup>		X
71	Adjust seat	11	A	B,C	X
72	Adjust steer-throttle control	11	A-G		X
72	Check turret seal	11	A,B		X
72	Operate drain valves	11	A,C	B	X
73	Adjust periscopes	11	A-D	E	X
73	Operate periscope wiper and washer	16	A-D <sup>2</sup>		X
73	OPERATE FIRE EXTINGUISHERS				
73	Engine compartment-automatic	17	A-I	J	X
74	Engine compartment-manual	18	A-I	J,K	X
75	Crew compartment-automatic	19	A-F	G,H	X
76	Crew compartment-manual	20	A-G	H,I	X
77	Portable fire extinguishers	-		A-I	-
78	CHECK WARNING AND CAUTION LIGHTS				
78	Check MASTER WARNING light	1	A-G		X
79	Check MAINTENANCE MONITOR lights (MASTER CAUTION)	1,2	A-H,J,K	I	X
81	TRANSFER FUEL	3	A-C		X
82	START ENGINE				
82	Normal start	12	A,C-E	B	X
83	Aborted start	43	A-G		X
84	MAKE AFTER START CHECKS				
84	Check engine indicators	13	A-G		X
85	Check warning and caution lights (see 78,79)	13	A,B		X
85	Check hydraulics	13	A-C		X
86	Check brakes	13	A-W		X
88	OPERATE GAS PARTICULATE FILTER SYSTEM	6	A-I,J <sup>3</sup> ,K-R		X
90	OPERATE SMOKE GENERATOR	25	A-C		X
91	OPERATE PERSONNEL HEATER	5	A-H		X <sup>3</sup>

<sup>1</sup>Hatch will not open.

<sup>2</sup>Periscope washer and wiper do not work.

<sup>3</sup>Heater will not heat air.

PAGE	TASK	PROCEDURE	YES	NO	CAP
92	DRIVE TANK				
92	Operate Driving Controls				
92	Operate transmission control	7	A-E		X
93	Operate steer control	9	A-F		X
95	Operate brake controls	8	A-D		X
96	Move Tank	21	A-J		X
97	Drive Up and Down Hills	(DP 22-27)	A-F		X
97	Drive Over Obstacles	23	A-K		X
99	Drive Across Ditch	24	A-J		X
100	Drive at Night				
100	Operate outside lights	4	A-E		X
101	Use infrared lenses	-		A-AA	-
103	Operate driver's night vision viewer	10	A-E		X
287	Operate Tank on Snow or Ice	33 <sup>1</sup>	A-I		X
288	Operate Tank on Sand or Mud	33 <sup>1</sup>	A-I		X
289	Ford Water Obstacle				
289	Ford shallow water	-	A-H	I	(X)
290	Ford deep water				
290	Install water fording kit items	-		C	-
298	Drive into water obstacle	32	A-J		X
299	Drive out of water obstacle	32	A-C	D-F	X
300	Prepare tank for operation after fording	-	B1	B2-B12	-
107	SHUT DOWN ENGINE	14	A-M		X
108	POWER DOWN AND SECURE STATION				
108	Power down hull systems	15	A-E		X
109	Close driver's hatch	16	B-J	A	X
109	Exit driver's station	16	A-C	D, E	X
269	SLAVE START ENGINE	-2			
269	Prepare Tank				
269	Prepare dead tank		A-G, K, L	H-J	(X)
270	Prepare live tank		A-C		(X)
270	Position live tank		B, C	A	(X <sup>3</sup> )
271	Start Dead Tank		LIVE: A-E, K-M, O-Q DEAD: A-D, F-J, N, O, P, R, S		(X)

<sup>1</sup>Procedure 33 in Driving Program 27, as per Trainer Engineering Design Report (Final), Revision A, Vol.4, p.979.

<sup>2</sup>The in-tank steps of this task were to have been provided (Specification for XM1 Tank Driver Trainer Device A17813, 10 April 1979, p.23).

<sup>3</sup>Requires new visuals of ground guide, or audio TC instructions.

PAGE	TASK	PROCEDURE	YES	NO	CAP
273	TOW DISABLED TANK	-		ALL	-
285	RETRIEVE MIRED TANK	-	MIRED: B, C,E,F,H-M TOW: F-H, K-M	MIRED: A, D,N TOW: D,N	(X) (X)
306	INSTALL THROWN TRACK	-		ALL	-
315	SHORT TRACKING	-		ALL	-
319	SILENT WATCH DUTY CYCLE	-	A-I		(X)
	EMERGENCY PROCEDURES				
322	Loss of engine power	48,49,81	A-E		X
322	Loss of steering	82	A-G		X
323	Loss of service brakes	83	A-G		X
324	Remove injured crewmember	-		ALL	-
327	Unlock stuck parking brakes	-	A,L,Y,Z	B-K,M-X	-
328	Engine failure to shut down	45	A-C		X
331	Decontaminate Tank	-		ALL	-
	TROUBLESHOOTING <sup>1</sup>				
	Driver's Warning and Caution Lights				
3-10	1. MASTER WARNING light lit, no other warning (red) lights lit	-	1,2a,3,4	2b	(X)
10	2. MASTER WARNING light not lit where any other warning light is lit	-	1b	1a	(X)
10	3. MASTER CAUTION light lit, no other caution (yellow) lights lit	-	1,2a,3,4	2b	(X)
11	4. MASTER CAUTION light not lit when any other caution light is lit	-	1b	1a	(X)
11	5. ENGINE OIL TEMP HIGH light lit	52	1-4	5,6	X
12	6. ENGINE OIL PRESSURE LOW light lit	53	1,3-5	2	X
12	7. ENGINE OIL LOW light lit	54	1,2	3	X
13	8. TRANSMISSION OIL LOW light lit	57		a,b	X
13	9. TRANSMISSION OIL PRESSURE LOW light lit	56	1-3,5	4	X
14	10. TRANSMISSION OIL TEMP HIGH light lit	55	1-5,7,8	6,9	X
15	11. HYDRAULIC SYSTEM MALFUNCTION light lit	89		a,b	X
16	12. PARKING/SERVICE BRAKES light does not light when parking brake pedal is depressed	-	1-3,4b	4a	(X)
16	13. PARKING/SERVICE BRAKES light does not light when service brake pedal is pushed longer than two minutes - engine running	-	1-3,4b	4a	(X)
17	14. PARKING/SERVICE BRAKES light stays lit when brakes are released - engine running	-	1,2a	2b	(X)
17	15. CIRCUIT BREAKER OPEN light lit	63,64	1-3		X
18	16. Circuit breaker at off position, CIRCUIT BREAKER OPEN light not lit	-	b	a	(X)

<sup>1</sup>For all troubleshooting symptoms marked (X) in the Capability column, actions can be performed if symptom can be induced.



PAGE	TASK	PROCEDURE	YES	NO	CAP
18	17. CABLE DISCONNECTED light lit	87	b	a	X
18	18. LOW BATTERY CHARGE light lit - engine running	61	1-3,6,7	4,5	X
19	19. LOW BATTERY CHARGE light lit - engine off	61	1-4		X
20	20. REAR FUEL PUMP - R light lit	66	1,2		X
20	21. REAR FUEL PUMP - L light lit	68	1,2		X
21	22. FUEL CONTROL FAULTY light lit	48,50	1-8		X
Driver's Indicator Lights					
24	27. ENGINE STARTED light not lit when engine starts	-	1,2b	2a	(X)
25	28. SWITCH INDICATOR light not lit when switch is set to ON	-	1,2b	2a	(X)
Driver's Gages and Meters					
33	45. Fuel gage shows empty when fuel is in tank	-	1		(X)
33	46. Speedometer reads zero when tank is moving	-	1		(X)
33	47. Voltmeter reads less than 23 volts with engine running	-	1,2,5,6	3,4	(X)
Engine					
34	48. Engine does not crank	41	1	2,3,4	X
35	49. Engine cranks but does not start	42	1,2,4b,5b,6,7	3,4a,5a,8	X
36	50. Engine cranks but shorts start	43	1,2,4	5	X
37	51. Starter does not engage when switch set to STARTER ONLY ENGAGED	-	1		(X)
37	52. Engine speed does not go to 1250 RPM to 1350 RPM when transmission control set to PVT	-	1		(X)
38	53. Engine smokes	-	1	2	(X)
38	54. Engine operates with reduced power	-	1,3b,4	2,3a	(X)
39	55. Engine shuts down automatically	-	1,2b	2a	(X)
39	56. Engine does not shut down	45	1		X
39	57. Front fuel pump does not work	67	1		X
Transmission					
40	58. Transmission does not shift gears when transmission control is moved	58	a,b		X
40	59. Tank does not move	-	1,2,5,6	3,4,7	(X)
41	60. Tank does not turn when steer-throttle control is turned	82	1	2,5	X
42	61. Tank pivots in neutral	-	4,8		(X)
Brakes					
42	62. Service brakes do not slow or stop tank	83	1,2	3	X

PAGE	TASK	PROCEDURE	YES	NO	CAP
43	63. Parking brake does not stop tank	-	1-4,6	5	(X)
	Driving Lights and Domelights				
43	64. Driver's domelight does not work	-	1	2,3	(X)
44	65. Service light(s) does not work	-	1	2,3	(X)
44	66. High beam light(s) does not work	-	1	2	(X)
45	67. Blackout light(s) does not work	-	1	2,3	(X)
46	68. Stoplight(s) does not work	-	1	2,3	(X)
46	69. Turret domelight does not work	-	1	2,3	(X)
	Tank Electrical Power				
47	70. No power when VEHICLE MASTER POWER switch set to ON at either commander's or driver's station	-	1,2	3,4	(X)
48	71. No hull power	-	a,b		(X)
48	72. No turret power	-	a,b		(X)
48	73. No lights on driver's panel when PANEL LIGHTS TEST button on driver's panel is pressed	-	a,b		(X)
	Auxiliary Systems				
65	114. Auxiliary hydraulic a <sub>1</sub> does not work	-	2	1	(X)
66	116. Smoke generator does not produce smoke	-	a,b		(X)
67	117. Driver's gas particulate heater does not warm air	-	a,b		(X) <sup>1</sup>
68	121. Gas particulate filter blower motor does not work	-	1,2	3,4	(X)
69	122. Bilge pump does not work - engine running	-	a,b		(X)
69	123. Bilge pump does not work - engine off	-	1,2		(X)
69	124. Night vision viewer does not work with night periscope switch set to ON	-	1-4		(X)
70	125. Night vision viewer does not work on battery power	-	1,2		(X)
70	126. Personnel heater fan does not work when personnel heater switch is set to RUN FAN	-	a,b		(X)
71	127. Personnel heater and fan do not work when personnel heater switch is set to RUN FAN	-	1b,2,3	1a	(X)
71	128. Personnel heater blows cold air	-	1b,2,3	1a	(X) <sup>1</sup>

<sup>1</sup>Heater does not heat air.

PAGE	TASK	PROCEDURE	YES	NO	CAP
	MAINTENANCE				
3-75	REPLACE LAMPS	-		ALL	-
85	ADJUST HEADLIGHTS	-		A-W	-
87	MAINTAIN PERISCOPES				
87	Service Driver's Periscope Washer Fluid Reservoir	-		A-C	-
87	Replace Driver's or Loader's Periscope				
87	Remove periscope	- <sup>1</sup>	A-D		(X)
88	Install periscope	- <sup>1</sup>	A-C		(X)
89	Clean Lenses	-		A, B	-
90	Clean Sight Lenses	-		A, C	-
91	MAINTAIN PRECLEANER AND AIR CLEANER FILTERS	-		ALL	-
99	REFUEL TANK	-		ALL	-
103	MAINTAIN BATTERIES	-		ALL	-
108	MAINTAIN TRACK	-		ALL	-

<sup>1</sup>Was to have been provided (Specification for XM1 Tank Driver Trainer Device A17813, 10 April 1979, p.24).

**APPENDIX B**

**CAPABILITIES ANALYSIS FOR  
GUNNER TASKS ON U-COFT**

## KEY

- TM Page, Task: In these two columns are the tasks for the gunner as derived from TM 9-2350-255-10, and the page number on which they appear. The tasks have been grouped by functional area, for the most part.
- Yes/No: In these two columns are task step designators, as found in TM 9-2350-255-10, which could or could not be performed on the device. The decision is based on device physical and hardware characteristics, and represents potential capability, pending software development, as well as actual capability. If a step is in the Yes column, it means that the device is or could be configured to present the initiating stimulus for the step and the system response resulting from the step. Two such sets of Yes/No columns appear, for the two manufacturers' devices. The device literature available did not specify actual procedures to be provided, so entries in these columns reflect potential capability only.
- Cap[able]: Device claims were not sufficiently detailed to permit the distinction between claimed and potential capability. An "X" means that the device has the physical characteristics and hardware such that it should be possible to configure software for training. A "-" in this column means that the device is not equipped to present the initiating stimuli and/or system responses for the major or more skilled portions of the task.

CAPABILITIES ANALYSIS FOR  
GUNNER TASKS ON U-COFT

TM PAGE	TASK	GENERAL ELECTRIC			CHRYSLER		
		YES	NO	CAP	YES	NO	CAP
2-141	PREPARE STATION FOR OPERATION						
141	Enter gunner's station	D	A-C, E-G	-	D, E	A-C, F, G	-
142	Operate dome light	A-D		X	A-D		X
142	Adjust seat	A-E		X	A-E		X
143	Adjust brow pads	A-E		X	A-E		X
143	Position chestrest for firing	A-E		X	A-E		X
144	Operate ballistic doors	A-D		X	A-D		X
144	Operate intercom	A-F		X	A-F		X
49	Perform Before and Services	ALL		X	ALL		X
145	Power Up Gunner's Station						
146	Test GPS and TIS panel lights	A, B		X	A, B		X
146	Check hydraulic pressure	C1, C2 <sup>1</sup>		-	C1, C2		X
	Perform GPS adjustments (see 149)						
	Perform TIS adjustments (see 153)						
147	Test computer lights	F-I		X	F-I		X
	Perform GAS adjustments (see 157)						
149	OPERATE GPS						
149	Perform GPS adjustments	C-S <sup>1</sup>	A, B	X	A-S		X
158	Perform GPS functional check	C-O <sup>1</sup>	A, B	X	A-O		X
153	OPERATE TIS						
153	Perform TIS adjustments						
153	Perform TIS check	A-E		X	A-E		X
153	Adjust TIS picture	A-J		X	A-J		X
157	OPERATE GAS						
157	Perform GAS adjustments	A-K		X	A-K		X
160	Use ballistic reticles	A-Q		X	A-Q		X
163	OPERATE BALLISTIC COMPUTER						
163	Perform computer self test	A, D-S <sup>1</sup>	B, C	X	A-S		X
170	Perform computer data check	A-AI <sup>1</sup>		X	A-AI		X
175	Operate computer control panel	A-H		X	A-H		X
167	OPERATE GUNNER'S POWER CONTROL HANDLES	A, D-L	B, C	X	A-L		X
169	OPERATE GUNNER'S MANUAL ELEVATION CRANK	B-E	A	X	A-E		X
169	OPERATE GUNNER'S MANUAL TRAVERSE CRANK	B-D	A	X	A-D		X

<sup>1</sup>Hydraulic pressure reads 1600.

PAGE	TASK	GENERAL ELECTRIC			CHRYSLER		
		YES	NO	CAP	YES	NO	CAP
180	TLST FIRE CONTROL SYSTEM						
180	Perform lead system check	A,D-O	B,C,P	X	A-P		X
182	Perform firing circuits check	A,D,H,I- J <sup>1</sup> ,K,L, H-N <sup>1</sup> ,P <sup>1</sup> , S <sup>1</sup> ,T,U <sup>1</sup> , V,W,X <sup>1</sup>	B,C,E-G, I-J <sup>1</sup> ,M-N <sup>1</sup> , O,P <sup>1</sup> ,Q,R, S <sup>1</sup> ,U <sup>1</sup> ,X <sup>1</sup>	-	A-D,H,I- J <sup>1</sup> ,K,L, H-N <sup>1</sup> ,O,P <sup>1</sup> , Q,R,S <sup>1</sup> ,T, U <sup>1</sup> ,V,W,X <sup>1</sup>	E-C,I-J <sup>1</sup> , M-N <sup>1</sup> ,P <sup>1</sup> , S <sup>1</sup> ,U <sup>1</sup> , X <sup>1</sup>	-
185	Perform crosswind sensor check	A,B,E,F,H	C,D,G	-	A,B,E,F,H	C,D,G	-
186	ALINE MRS	A,D-O	B,C	X	A-O		X
188	OPERATE COAX						
148	Install coax	A	B-I	-	A-I		X
188	Load coax (see 241, Loader)	A,B,V,X-Z	C-U,W,AA- AH	-	A,B,V,X- AE,AH	C-U,W,AF, AG	-
188	Fire coax	A,D-F,I-P	B,C,G,H	X	A-C,I-P	H	X
190	Zero coax	B,C,H-W	A,D-G	X	B-D,F-W	A,E	X
192	Clear coax (see 243, Loader)	A-F,L2- L4	G-K,L1	X	A-H,J-L	I	X
192	Perform failure to fire procedure	A1-A5,A7, A8	A6	X	A1-A5,A7, A8	A6	X
193	Perform procedure for runaway firing	C	A,B,D	-	C	A,B,D	-
193	Change barrel	A,B	C-I	-	A-I		X
214	Remove coax		A-F	-	A-F		X
195	OPERATE LRF	A-G		X	A-G		X
198	OPERATE MAIN GUN						
198	Fire Main Gun						
198	Prepare to fire	A,D,E,G	B,C,F	X	A-E,G	F	X
198	Fire in normal mode	A-J		X	A-J		X
200	Fire in emergency mode	A,B		X	A,B		X
200	Fire in manual mode	A-G		X	A-C		X
201	Operate blasting machine	B,C	A	X	B,C	A	X
209	Perform failure to fire	A-D,F	E,G,H	X	A-D,F	E,G,H	X
202	BORESIGHT GPS	A,D-F,J- U,W-AH	B,C,G-I, Q <sup>2</sup> ,V	X	A-F,J-U, W-AH	G-I,Q <sup>2</sup> , V	X
206	BORESIGHT GAS	A(see 202 A-I),B-F	A(see 202 A-I)	X	A(see 202 A-1),B-F	A(see 202 A-1)	X
207	ZERO MAIN GUN						
207	Prepare to zero	A,B,D-L	C	X	A,B,D-L	C	X
207	Fire for zero	A,C-H	B	X	A,C-H	B	X
208	Fire for confirmation	A-H		X	A-H		X
209	Verify zero	A-C		X	A-C		X
210	PERFORM HYDRAULIC ZERO PRESSURE CHECK	A-D,E-F <sup>3</sup>	E-F <sup>3</sup>	-	A-F		X

<sup>1</sup>Actions can be performed, but no system response will be provided (no firing tester).

<sup>2</sup>Loader actions must be simulated.

<sup>3</sup>Hydraulic pressure reads 1600.

PAGE	TASK	GENERAL ELECTRIC			CHRYSLER		
		YES	NO	CAP	YES	NO	CAP
211	OPERATE GAS PARTICULATE FILTER SYSTEM	A-H, I <sup>1</sup> , J-O		X	A-H, I <sup>1</sup> , J-O		X
213	OPERATE FIRE EXTINGUISHERS						
213	Operate external fire extinguisher handle		A, B	-		A, B	-
213	Operate portable fire extinguisher		A-I	-		A-I	-
214	POWER DOWN AND SECURE STATION						
215	Power down gunner's station	A-F, H, I	G	X	A-I		X
215	Exit tank		A-C	-		A-C	-
289	FORD DEEP WATER OBSTACLE						
289	Install water fording kit items	B1, B2, B4	B3, B5-B41	-	B1-B4	B5-B41	-
302	Prepare tank for operation after fording	D1, D2	D3-D39	-	D1, D2	D3-D39	-
300	INSTALL THROWN TRACK		ALL	-		ALL	-
324	REMOVE INJURED CREWMEMBER		ALL	-		ALL	-
331	DECONTAMINATE TANK		ALL	-		ALL	-
3-77	REPLACE LAMPS						
77	Replace Indicator Lamp		ALL	-		ALL	-
79	Replace Computer Panel Indicator Lamp		ALL	-		ALL	-
	TROUBLESHOOTING <sup>2</sup>						
	Gunner's Indicator Lights						
3-27	32. EMERGENCY light on GPS not lit when FIRE CONTROL MODE switch set to EMER	1, 2, 4b	3, 4a	-	1, 2, 4b	3, 4a	-
27	33. NORMAL light on GPS not lit when FIRE CONTROL MODE switch set to NORMAL	1, 2, 4b	3, 4a	-	1, 2, 4b	3, 4a	-
28	34. MANUAL light on GPS not lit when FIRE CONTROL MODE switch set to MANUAL	2b	1, 2a	-	2b	1, 2a	-
28	35. AMMUNITION SELECT light not lit.	1, 2b	2a	-	1, 2b	2a	-
28	36. TRIGGER SAFE light on GPS not lit when GUN SELECT switch set to TRIGGER SAFE.	1	2	-	1	2	-
29	37. MAIN light on GPS not lit when GUN SELECT switch set to MAIN	1, 3b	2, 3a	-	1, 3b	2, 3a	-
29	38. COAX light on GPS not lit when GUN SELECT switch set to COAX	1, 3b	2, 3a	-	1, 3b	2, 3a	-

<sup>1</sup>HJ heater control does not provide warm air.

<sup>2</sup>For all troubleshooting symptoms marked X in the Capability column, actions can be performed if symptom can be induced.



PAGE	TASK	GENERAL ELECTRIC			CHRYSLER		
		YES	NO	CAP	YES	NO	CAP
	Fire Control System						
50	78. Main gun rounds do not hit target using GPS daylight sight	1-4		X	1-4		X
50	79. Gunner's GPS has no reticle	2,3	1	-	2,3	1	-
51	80. Gunner's GPS PANEL LIGHTS test will not work		1	-		1	-
51	81. Gunner's GPS does not work		1	-		1	-
51	82. GPS defroster does not work		1	-		1	-
52	83. "P" symbol in GPS eyepiece is lit	1	2	-	1	2	-
52	84. TIS does not work when THERMAL MODE switch set from STANDBY to ON	1-4		X	1-4		X
52	85. No thermal image	1,2,4	3	X	1,2,4	3	X
53	86. TIS does not work		1	-		1	-
53	87. Unable to lase on target	1-3	4	X	1-3	4	X
54	88. GAS has no reticle	1	2	-	1	2	-
54	89. Computer failure (1)	1-6		X	1-6		X
55	90. Cant sensor failure (2)		1	-		1	-
55	91. Crosswind sensor failure (3)	3,5	1,2,4	-	3,5	1,2,4	-
55	92. Lead (azimuth rate) failure(4)	1,3a <sup>1</sup> ,4	2,3b	X	1,3a <sup>1</sup> ,4	2,3b	X
56	93. Elevation rate failure (5)	1-3		X	1-3		X
56	94. Data link failure (7)	1-4		X	1-4		X
57	95. LRF failure (8)	1-4		X	1-4		X
	Weapon System						
57	96. Main gun will not elevate or depress when GPS FIRE CONTROL switch set to NORMAL or EMERGENCY	1,4	2,3	-	1,2,4	3	-
57	97. Turret will not traverse when FIRE CONTROL switch set to NORMAL or EMERGENCY	3,4	1,2	-	1,3,4	2	-
58	98. Unable to traverse turret and elevate/depress main gun with GPS FIRE CONTROL switch set to NORMAL or EMERGENCY	4-6,7 <sup>1</sup> ,8	1-3,9	X	2-6,7 <sup>1</sup> ,8	1,9	X
59	99. Turret will not traverse in MANUAL mode	2,4	1,3	-	1,2,4	3	-
59	100. Main gun does not elevate/depress in MANUAL mode	2,4	1,3	-	1,2,4	3	-
60	101. Unable to fire main gun at gunner's handle		1,2	-		1,2	-
62	107. Coax machinegun will not fire	1,2	3,4	X	1,2	3,4	X

<sup>1</sup>Hydraulic pressure reads 1600.

APPENDIX C

TRAINING MODE ANALYSIS  
FOR TASKS SELECTED FOR OSUT



		OSUT			
		DT	U-COFT	XMI	FIELD
Engine Failure		X			
Engine Gas Overtemp		X			
Engine Oil Pressure Low		X			
Transmission Oil Temperature High		X			
Transmission Oil Pressure Low		X			
Automatic Crew Compartment Fire Extinguisher		X			
Maintenance Monitor Circuit Breaker Pops		X			
Thrown Left Track		X			
Engine Overspeed		X			
Throttle Failure		X			
Steering Failure		X			
Decontaminate Tank				X-D	
3. Slave Start an XMI Tank	Slave Start Tank	(X) <sup>1</sup>		X-N	X
4. Perform Fuel Transfer Procedures on an XMI Tank	Fuel Systems <sup>2</sup>	X			
	Low Fuel Level <sup>2</sup>	X			
	Transfer Pump Failure <sup>2</sup>	X			
5. Self Recover an XMI Tank	Self Recover an XMI Tank <sup>3</sup>			X-N	X
6. Recover an XMI Tank by Similar Vehicle	Tow Disabled Tank <sup>4</sup>			X-N	X
	Retrieve Mired Tank <sup>4</sup>	(X)		K-N	X
7. Prepare Driver's Station for Operation	Enter Driver's Station			X-D	
	Prepare Station for Operation/Power Up Hull	X			
8. Secure Driver's Station	Secure Driver's Station/After Operations Checks	X			
9. Operate AN/VVS-2 (Night Vision Viewer)	Night Vision Viewer	X			
10. Remove/Install Track Blocks on XMI Tank	Remove/Install Track Link			X-N	X
11. Troubleshoot AN/VVS-2	Troubleshoot Night Vision Viewer (Symptoms 124,125)	(X)			

<sup>1</sup>The in-tank steps of this task were to have been provided (Specification for XMI Tank Driver Trainer Device A17B13, 10 April 1979, p. 23).

<sup>2</sup>Also listed under Task 12.

<sup>3</sup>Procedure not covered in Operator's Manual.

<sup>4</sup>Also listed under Task 60.

- Warning and Caution Lights
- Mull Circuit Breakers
- Fuel Systems<sup>1</sup>
- Fire Extinguisher/Engine
  - Compartment Automatic<sup>2</sup>
- Loss of Power/Fuel Control
  - Faulty Light<sup>3</sup>
- Loss of Power/Fuel Control
  - Faulty Light Not Lit<sup>3</sup>
- Fuel Control Faulty Light/
  - No Loss of Power<sup>3</sup>
- Engine Oil Temperature High
- Engine Oil Pressure Low
- Engine Oil Low
- Transmission Oil Temperature
  - High
- Transmission Oil Pressure Low
- Transmission Oil Low
- Transmission Gear Shift Control
  - Circuit Breaker<sup>4</sup>
- Engine Overspeed<sup>3</sup>
- Engine Gas Overtemp
- Low Battery Charge
- Clogged Filters
- Master Panel Circuit Breaker
- Maintenance Monitor Circuit
  - Breaker
- Low Fuel Level<sup>1</sup>
- Right Fuel Pump Failure
- Transfer Pump Failure<sup>1</sup>
- Left Fuel Pump Circuit Breaker
- Alternator Failure
- Cable Disconnect
- Battery Cable Disconnect
- Hydraulic Pump Failure
- Troubleshoot MASTER WARNING and MASTER CAUTION Lights
  - (Symptoms 1-4)
- Troubleshoot PARKING/SERVICE BRAKES Lights (Symptoms 12-14)
- Troubleshoot CLutch BREAKER OPEN Light (Symptom 16)
- Troubleshoot Driver's Indicator Lights (Symptoms 27, 28)

OSUT			
DT	M-COFT	SQ	FIEL
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
X			
(X)			
(X)			
(X)			
(X)			

<sup>b</sup>Also listed under Task 14.

2015

		OSUT			
		DT	U-COFT	XMI	FIEL
Troubleshoot Loss of Tank Electrical Power	Troubleshoot Loss of Tank Electrical Power (Symptoms 70-73)	(X)			
Troubleshoot Tank Auxiliary Systems	Troubleshoot Tank Auxiliary Systems (Symptoms 114,116,122, 123)	(X)			
17. Perform Before Operations Checks and Services	Preventive Maintenance Checks and Services: Vehicle			X-D	
18. Perform During Operations Checks and Services	Hull Hull Rear Driver's Station	(X)		X-D X-D X-L	
19. Perform After Operations Checks and Services	Turret Gunner's Station Power Gun/Turret Control Loader's Station		X X	X-D  X-D	
20. Perform Prepare to Fire Checks and Services	Pre/Post Firing Preventive Maintenance Checks and Services:				
21. Perform During Firing Checks and Services	Gunner's Station		X		
22. Perform After Firing Checks and Services	Loader's Station			X-D	
23. Prepare Loader's Station for Operation	Open Loader's Hatch Enter/Service Crosswind Sensor Enter Loader's Station Operate Dowlight Adjust Seat and Platform Power Up Loader's Station Operate Intercom Operate Loader's Hatch from Inside Install Loader's Periscope Install Night Vision Viewer Position Loader's Guards for Firing Check Turret Networks Box			X-D X-D X-F X-D X-D X-D X-D X-D X-D X-D X-D X-D X-D	
24. Secure Loader's Station	Stow Loader Guards Remove Periscope Remove Night Vision Viewer Secure Loader's Station Stow Crosswind Sensor Exit Through Loader's Hatch Close and Lock Loader's Hatch			X-D X-D X-D X-D X-D X-D X-D	
Operate Main Gun Breechblock	Open Breech Manually Close Breech Manually Close Breech - Emergency			X-D X-D X-D	

		OSUT			
		DT	U-COPI	XMI	FIELD
25. Perform Operator Maintenance on 105mm Breechblock Assembly	Remove Breechblock Clean and Inspect Breechblock Install Breechblock			X-D X-D X-D	
26. Load/Unload 105mm Main Gun (Operate Main Gun)	Check Replenisher Service Replenisher Load Main Gun Clear Main Gun Perform Manual Extraction of Round Adjust Main Gun for Cold Weather			X-D X-D X-D X-D X-D X-D	X
27. Load/Unload M250 Grenade Launcher	Load/Unload M250 Grenade Launcher			X-D	
Operate Loader's Periscope	Operate Loader's Periscope			X-D	
Operate Loader's Panel	Operate Loader's Panel			X-D	
Operate Main Gun Elevation Travel Lock	Operate Main Gun Elevation Travel Lock			X-D	
Open Turret Traverse Lock	Operate Turret Traverse Lock			X-D	
Operate Loader's Machinegun	Install Loader's Machinegun Load Loader's Machinegun Fire Loader's Machinegun Clear Loader's Machinegun Change Barrel Empty Loader's Machinegun Spent Case Gun Remove Loader's Machinegun			X-D X-D X-D X-D X-D X-D X-D	
Troubleshoot Loader's Indicator Lights	Troubleshoot Loader's Indicator Lights (Symptoms 39-44)			X-D	
Troubleshoot Ammunition Compartments	Troubleshoot Ammunition Compartments (Symptoms 108-113)			X-D	
Troubleshoot Turret Lock	Troubleshoot Turret Lock (Symptoms 130,131)			X-D	



		OSMT			
		DT	U-COFT	XOI	FIELD
28. Prepare Gunner's Station for Operation	Enter Gunner's Station			X-D	
	Operate Downlight		X		
	Adjust Seat		X		
	Adjust Browpda		X		
	Position Cleatrest for Firing		X		
	Operate Ballistic Doors		X		
	Operate Intercom		X		
	Test GPS and TIS Panel Lights		X		
	Check Hydraulic Pressure		X <sup>1</sup>		
	Perform GPS Adjustments		X		
	Perform TIS Adjustments		X		
	Test Computer Lights		X		
	Perform SAS Adjustments		X		
	Perform GPS Functional Check		X		
	Perform TIS Check		X		
	Adjust TIS Picture		X		
	Perform Computer Self Test		X		
	Perform Computer Data Check		X		
	Perform Crossed Sensor Check		X		
	Align MFS		X		
Perform Anti System Check		X			
Perform Filter Circuits Check				X-D	
Perform Hy. Fluids Zero Pressure Check			X <sup>1</sup>		X-D
29. Secure Gunner's Station on XM1 Tank	Disarm Gunner's Station		X		
	Exit Tank				X-D
30. Troubleshoot Fire Control System	Troubleshoot Fire Control System (Symptoms 78-80, 85, 97, 98, 99-95)		X		
	Troubleshoot Fire Control System (Symptoms 79-80, 80, 88, 90, 91)				X-D
31. Troubleshoot the 105 mm Main Gun	Troubleshoot Main Gun (Symptom 98)		X		
	Troubleshoot Main Gun (Symptoms 98, 99, 99-105)				X-D
32. Mount/Dismount M240 Machinegun	Install Coax		X <sup>1</sup>		X-D
	Remove Coax		X <sup>1</sup>		X-D
33. Perform Operator Maintenance on M240 Machinegun	Load Coax				X-D
	Change Barrel		X <sup>1</sup>		X-D

		OSUT			FIELD
		DT	U-COFT	KMI	
Troubleshoot M240 Machinegun	Perform Fail to Fire Procedure Perform Procedure for Runaway Firing Troubleshoot Coax (Symptom 107)		X		X-D
			X		
34. Zero M240 Machinegun	Zero Coax		X		
35. Engage Targets with M240 Machinegun	Fire Coax		X		
36. Clear M240 Machinegun to Prevent Accidental Discharge	Clear Coax		X		
37. Boresight Main Gun	Boresight GPS Boresight GAS		X X		
38. Zero Main Gun	Prepare to Zero Fire for Zero Fire for Confirmation Verify Zero		X X X X		
39. Manually Input Fire Control Data into Computer	Operate Computer Control Panel		X		
40. Engage Targets with Main Gun	Prepare to Fire Fire in Normal Mode Fire in Emergency Mode Fire in Manual Mode Operate Blasting Machine Perform Failure to Fire		X X X X X X		
Operate Laser Rangefinder	Operate Laser Rangefinder		X		
Use Ballistic Reticles	Use Ballistic Reticles		X		
Operate Gunner's Power Control Handles	Operate Gunner's Power Control Handles		X		
Use Gunner's Manual Elevation Crank	Use Gunner's Manual Elevation Crank		X		
Use Gunner's Manual Traverse Crank	Use Gunner's Manual Traverse Crank		X		
Troubleshoot Gunner's Indicator Lights	Troubleshoot Gunner's Indicator Lights (Symptoms 32-38)				X-D

		OSUT		
		DT	U-COPT	XML
Operate Gas Particulate Filter System	Operate Gas Particulate Filter System (Driver) Operate Gas Particulate Filter System (Gunner) Operate Gas Particulate Filter System (Loader)	X	X	X-D
41. Perform Operate Maintenance on XML Tank Periscopes	Remove/Install Driver's Periscope Remove/Install Loader's Periscope Service Driver's Periscope Washer Fluid Reservoir Clean Lenses Clean Sight Lenses	(X) <sup>1</sup>	X	X-D X-D X-D
42. Stow Ammunition on an XML Tank	Operate Main Gun Ammunition Storage Racks: Hull Compartment Ready Compartment Semi-Ready Compartment Turret Floor Ready Racks Remove a Round			X-D X-D X-D X-D X-D
43. Establish Silent Watch from an XML Tank Turret	[Skill Level Three]			X
44. Prepare TC's Station (CWS) on an XML Tank	[Skill Level Three]			X
45. Secure TC's Station (CWS) on an XML Tank	[Skill Level Three]			X
46. Mount/Dismount a Cal .50 Machinegun on XML Tank	Install Commander's Weapon Remove Commander's Weapon			X-D X-D
47. Perform Operator Maintenance on Cal .50 Machinegun	Load Commander's Weapon			X-D
Troubleshoot Cal .50 Machinegun	Perform Failure to Fire Procedure Troubleshoot Cal .50 Machinegun		X X	
48. Boresight Cal .50 Machinegun	[Skill Level Three]			X
49. Zero Cal .50 Machinegun	[Skill Level Three]			X

<sup>1</sup>Removal and installation of seven-inch periscope was to have been provided (Specification for XML Driver Trainer Device A17B13, 10 April 1979, p. 24).

50. Set and Check Headspace on Cal .50 Machinegun [Skill Level Three]
51. Clear a Cal .50 Machinegun to Prevent Accidental Discharge Clear Commander's Weapon
52. Engage Targets with Cal .50 Machinegun Fire Commander's Weapon
53. Fire an M250 Grenade Launcher on an XM1 Tank Fire Grenade Launcher  
Perform Fail to Fire Procedures  
Troubleshoot Grenade Launcher (Symptom 129)
54. Prepare XM1 Tank Weapons for Travel Prepare Main Gun  
Prepare Coax  
Prepare Loader's Machinegun  
Prepare Commander's Weapon  
Prepare Grenade Launcher
55. Evacuate a Wounded Crewman from an XM1 Tank Remove Injured Crewmember Through Driver's Hatch  
Remove Injured Crewmember Through Loader's Hatch
56. Extinguish a Fire on an XM1 Tank Fire Extinguisher, Engine Compartment Automatic  
Fire Extinguisher, Engine Compartment Manual  
Fire Extinguisher, Crew Compartment Automatic  
Fire Extinguisher, Crew Compartment Manual  
Portable Fire Extinguisher  
External Fire Extinguisher
57. Perform Preventive Maintenance on Basic Issue Items on an XM1 Tank [Extension]
58. Lubricate an XM1 Tank According to the Lubrication Order (LO) Lubricate XM1 Tank<sup>1</sup>

DT	USDT			FIELD
	U-COPT	XM1		
				X
		X-D		
	X			
	X			
		X-D		
		X-D		
	X	X-D		
		X-D		
				X
				X
X				
X				
X				
X				
		X-D		
		X-D		
				X
		X-D		

<sup>1</sup>Procedure not covered in Operator's Manual.

59. Service Precleaner and Air Cleaner Filters on an XM1 Tank      Maintain Precleaner and Air Cleaner Filters
60. Tow an XM1 Tank      Tow Disabled Tank<sup>1</sup>  
Retrieve Mired Tank<sup>1</sup>
61. Clean/Service the 105mm Main Gun on an XM1 Tank      Service Bore Evacuator  
Service Main Gun Tube
62. Prepare a Range Card on an XM1 Tank      [Skill Level Three]
63. Short Track an XM1 Tank      [Extension]
64. Replace a Thrown Track on an XM1 Tank      [Extension]
65. Troubleshoot the XM1 Tank Turret Vent Blower      [Not Selected]
66. Prepare Power Pack for Removal on an XM1 Tank      [Extension]

OSUT			
BT	U-COFT	XM1	FIELD
(X)		X-D	
		X-N	X
		X-N	X
		X-N	X
		X-N	X
			X
			X

<sup>1</sup>Also listed under Task 6.

APPENDIX D  
DRIVER TRAINER PROCEDURES

**Procedure  
Program**

**Title**

- 6      **Engine Shutdown Malfunctions**  
        Procedure 45, Engine Will Not Shutdown  
        Procedure 46, Engine Stops Turning Too Quickly  
                After Shutdown  
        Procedure 47, Engine Idles Too Fast  
        \*Procedure, Engine Shuts Down Automatically
- 7      **Loss Of Engine Power**  
        Procedure 48, Loss of Power/Fuel Control Faulty Light  
        Procedure 49, Loss of Power/Fuel Control Faulty Light  
                Not Lit  
        Procedure 50, Fuel Control Faulty Light/No Loss of Power  
        Procedure 51, Engine Shuts Down After Momentary Power Loss  
        \*Procedure, Engine Operates With Reduced Power
- 8      **Engine/Transmission Oil Malfunctions**  
        Procedure 52, Engine Oil Temperature High  
        Procedure 53, Engine Oil Pressure Low  
        Procedure 54, Engine Oil Low  
        Procedure 55, Transmission Oil Temperature High  
        Procedure 56, Transmission Oil Pressure Low  
        Procedure 57, Transmission Oil Low  
        Procedure 58, Transmission Gear Shift Control Circuit Breaker
- 9      **Miscellaneous Warning/Caution Lights**  
        Procedure 59, Engine Overspeed  
        Procedure 60, Engine Gas Overtemp  
        Procedure 61, Low Battery Charge  
        Procedure 62, Clogged Filters  
        Procedure 63, Master Panel Circuit Breaker<sup>1</sup>  
        Procedure 64, Maintenance Monitor Circuit Breaker  
        Procedure 65, Low Fuel Level  
        \*Procedure, MASTER WARNING and MASTER CAUTION Lights  
        \*Procedure, Parking/Service Brakes  
        \*Procedure, Indicator Lights
- 10     **Miscellaneous Fuel Pump Malfunctions**  
        Procedure 66, Right Fuel Pump Failure  
        Procedure 67, Transfer Pump Failure  
        Procedure 68, Left Fuel Pump Circuit Breaker
- \*Miscellaneous Auxiliary System Malfunctions**  
        \*Procedure, Night Vision Viewer Does Not Work  
        \*Procedure, Personnel Heater Does Not Work  
        \*Procedure, Gas Particulate Heater Does Not Work  
        \*Procedure, Auxiliary Hydraulic System Does Not Work  
        \*Procedure, Smoke Generator Does Not Work  
        \*Procedure, Bilge Pump Does Not Work

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\*Procedure not provided by manufacturer.

<sup>1</sup>Add Symptom 16: Circuit Breaker at OFF Position, CKT BKR OPEN Light Not Lit.

**Procedure  
Program**

**Title**

- 1      **Systems Introduction, I**
  - Procedure 1, Warning and Caution Lights
  - Procedure 2, Hull Circuit Breakers
  - Procedure 3, Fuel Systems
  - Procedure 4, Exterior Lights
  - Procedure 5, Personnel Heater
  
- 2      **Systems Introduction, II**
  - Procedure 6, Gas Particle Filter
  - Procedure 7, Transmission Shift Control
  - Procedure 8, Brake Controls
  - Procedure 9, Steering/Throttle Control
  - \*Procedure, Periscopes
  - Procedure 10, Night Vision Viewer
  
- 3      **Start Up/Shut Down**
  - Procedure 11, Preparing the Station for Operation/  
Power Up Hull<sup>1</sup>
  - Procedure 12, Starting the Engine
  - Procedure 13, After Start Checks
  - Procedure 14, Engine Shutdown
  - Procedure 15, Power Down Hull
  - Procedure 16, Secure Driver Station/After Operation  
Check Procedure
  
- 4      **Fire Extinguishers**
  - Procedure 17, Fire Extinguisher, Engine Compartment  
Automatic
  - Procedure 18, Fire Extinguisher, Engine Compartment  
Manual
  - Procedure 19, Fire Extinguisher, Crew Compartment  
Automatic
  - Procedure 20, Fire Extinguisher, Crew Compartment  
Manual
  
- 5      **Engine Start Malfunctions**
  - Procedure 41, Engine Will Not Crank
  - Procedure 42, Engine Cranks But Will Not Start
  - Procedure 43, Engine Cranks But Aborts Start
  - Procedure 44, Engine Starts Then Shuts Down
  - \*Procedure, Starter Does Not Engage
  - \*Procedure, Engine Overspeed in Pivot
  - \*Procedure, Engine Smokes

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\*Procedure not provided by manufacturer.

<sup>1</sup>Add Before Operations Maintenance Checks and Services.



Procedure  
Program

Title

- \*Miscellaneous Gages and Meters Malfunctions
  - \*Procedure, Fuel Gage
  - \*Procedure, Speedometer
  - \*Procedure, Voltmeter
- \*Miscellaneous Circuit Breaker Malfunctions
  - \*Procedure, Exterior Lights
  - \*Procedure, Domelights
  - \*Procedure, Tank Electrical Power
- 11      Emergency Procedures #1
  - Procedure 81, Engine Failure
  - Procedure 82, Steering Failure
  - Procedure 83, Brake Failure<sup>1</sup>
  - Procedure 84, Throttle Failure
  - \*Procedure, Transmission Failure
- 12      Emergency Procedures #2
  - Procedure 85, Alternator Failure
  - Procedure 86, Loss of Vehicle Track
  - Procedure 87, Cable Disconnect
  - Procedure 88, Battery Cable Disconnect
  - Procedure 89, Hydraulic Pump Failure
- \*Emergency Procedures #3
  - \*Procedure, Slave Start Tank
  - \*Procedure, Retrieve Mired Tank
- 21      Driving Program #21
  - Audio Instructions Script
  - Procedure 21, Placing the Tank in Motion
  - Malfunction 9, Clogged Air Filter
  - Malfunction 8, Fuel Control Faulty
  - Malfunction 19, Transmission Gear Shift Control
- 22      Driving Program #22
  - Audio Instructions Script
  - Malfunction 12, Engine Oil Temperature High
  - Malfunction 18, Low Fuel Level
  - \*Procedure, Fording Shallow Water
  - Procedure 32, Fording Deep Water
  - Procedure 23, Driving Over Obstacle
  - Malfunction 3, Brake Failure

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\*Procedure not provided by manufacturer.

<sup>1</sup>Add Symptom 63: Parking Brake Does Not Stop Tank.

**Procedure  
Program**

**Title**

- 23      **Driving Program #23**  
         Audio Instructions Script  
         Malfunction 20, Master Panel Circuit Breaker Pops  
         Malfunction 5, Right Fuel Pump Failure  
         Procedure 24, Driving Over Ditch  
         Malfunction 10, Engine Compartment Fire, Automatic  
         Malfunction 4, Engine Failure
- 24      **Driving Program #24**  
         Audio Instructions Script  
         Procedure 25, Smoke Generator  
         Malfunction 16, Engine Gas Overtemp  
         Malfunction 13, Engine Oil Pressure Low
- 25      **Driving Program #25**  
         Audio Instructions Script  
         Malfunction 6, Alternator Failure  
         Malfunction 14, Transmission Oil Temperature High  
         Malfunction 15, Transmission Oil Pressure Low  
         Malfunction 11, Automatic Crew Compartment Fire  
         Extinguisher
- 26      **Driving Program #26**  
         Audio Instructions Script  
         Malfunction 21, Maintenance Monitor Circuit Breaker Pops  
         Malfunction 7, Thrown Left Track
- 27      **Driving Program #27**  
         Audio Instructions Script  
         \*Procedure, Reduced Traction  
         Malfunction 17, Engine Overspeed  
         Malfunction 1, Throttle Failure  
         Malfunction 2, Steering Failure

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\*Procedure not provided by manufacturer.

APPENDIX E

PROGRAM OF INSTRUCTION  
FOR 19K10 OSUT

XMI ARMOR CREWMAN COURSE

# PROGRAM OF INSTRUCTION

## 19K10 OSUT, XM1 Armor Crewman Course

<u>Section</u>	<u>Course</u>	<u>Page</u>
I	Preface	E-3
II	Summary	E-4
III	Body	E-5
IV	Annex A - Committee Group	E-8
IV	Annex B - Training Brigade	E-13
V	Ammunition Requirement	E-28

## SECTION I - Preface

### A. 19K10-OSUT, XML Armor Crewman Course

### B. Purpose:

To prepare individual soldiers to perform assigned job tasks at specific standards of proficiency. It addresses the training requirement for MOS 19K - Armor Crewman and is designed to be used by trainers in conjunction with the Soldier's Manual and the Commander's Supplement.

### C. Prerequisites:

Skill Level I - Open only to Active Army and Reserve Components. Standard score of 90 or higher on CO (combat operations) Battery Test. Driver Battery I - 85 or higher or civilian operator permit. Physical requirements: fully physically qualified - no limitation; normal color vision; good night vision; visual acuity correctable to 20/30 in each eye.

### D. Special Information:

Tank crew drill training, as listed in Training Circular Tank Crew Drill (XML) is conducted when possible as an integral part of listed classes. Students will be trained on subjects shown in Section IV, Annex A and B.

### E. Length: 13 weeks.

### F. Training Location: Fort Knox, Kentucky

### G. MOS/Speciality Feeder Pattern:

<u>Prerequisites</u> <u>MOS/Speciality</u>	<u>MOS/Speciality</u> <u>Trained in Course</u>	<u>Feeds Following</u> <u>MOS/Speciality</u>
Level I - None	19K XML Armor Crewman	19K XML Armor Crewman

### H. Ammunition Requirements: See Section V.

# SECTION II - Summary

COURSE: 19K10-OSUT, XM1 Armor Crewman Course

## Subjects

	<u>Hours</u>	<u>Annex</u>	<u>Page</u>
A. Academic Subjects			
Committee Group	76	A	6
1st Tng Bde	<u>459(1)</u>	B	11
SUBTOTAL	535		
B. Nonacademic Subjects			
Inprocessing	7		
Outprocessing	7		
Commandant's Time	<u>72(2)</u>		
SUBTOTAL	86		
TOTAL	621		
C. Recapitulation			
Security Classification			
Unclassified	621		
TOTAL	621		
Type of Instruction			
Conference (C)	50.5		
Practical Exercise (PE)	435.0		
Demonstration (D)	18.5		
Examination (E)	31.0		
Nonacademic	<u>86.0</u>		
TOTAL	621.0		

(1) 101 hours of instructions are after duty hours.

(2) Commandant's time includes road test for selected personnel, blood donor, draw/turn in weapons, troop pickups, immunizations, uniform fitting (phase II), orientations, brigade guard and detail, pay day activities, holidays, and graduation.

SECTION III - Body

Course 19K10, XM1 Armor Crewman Course

<u>Annex Title and Subjects</u>	<u>Hours</u>	<u>Annex</u>	<u>Page</u>
Committee Group		A	6
Fundamentals of the Soldier		A1	6
Code of Conduct	1		6
The Law of Land Warfare	2		6
Military Justice	3		6
Drug Abuse	2		6
Human Relations	2		7
US Government and Freedom Under Law	1		7
VD Orientation/Birth Control	2		7
SUBANNEX TOTAL	13		
Combat Skills and Tactics		A2	8
First Aid	8		8
NBC Defense	5		8
Combat Orientation Course	12		8
Defensive Combat Course	5		8
Combat Weapons Course	4		8
Map Reading	5		9
Opposing Forces Orientation	6		9
Cover and Camouflage	2		9
SUBANNEX TOTAL	47		
Weapons		A3	
M16A1 Rifle, BRM2	2		10
M16A1 Rifle, BRM3	8		10
Hand Grenades	4		10
Mines	2		10
SUBANNEX TOTAL	16		
ANNEX TOTAL	76		

<u>Training Brigade</u>	<u>Hours</u>	<u>Annex</u>	<u>Page</u>
<b>Driving</b>		<b>B1</b>	<b>11</b>
Driver Trainer	16		11
XMI Tank Operations -			
Driver's Station	8		11
Driving Exercises	<u>26</u>		12
SUBANNEX TOTAL	50		
<b>Gunnery</b>		<b>B2</b>	<b>13</b>
XMI Tank Operations -			
Loader's Station	24		13
Unit-Conduct of Fire Trainer	64		13
XMI Tank Operations -			
Gunner's Station	12		13
XMI Tank Operations -			
Commander's Station	4		13
Gunnery Exercises	<u>100</u>		14
SUBANNEX TOTAL	204		
<b>Maintenance and Miscellaneous Procedures</b>		<b>B3</b>	<b>15</b>
Preventive Maintenance Checks			
and Services	7		15
Fire Extinguishers	1		15
Water Fording Procedures	2		15
Infrared Lenses	1		15
Decontaminate Tank	1		15
Lubricate Tank	2		15
Service Precleaner and Air Cleaner			
Filters	<u>2</u>		16
SUBANNEX TOTAL	16		
<b>Weapons</b>		<b>B4</b>	<b>17</b>
Mechanical Training, M16A1 Rifle	4		17
Maintain the M16A1 Rifle	6		17
Mechanical Training .45 Cal Pistol	4		17
Fundamentals of Firing Positions			
for the .45 Cal Pistol	4		17
Preparatory Marksmanship Training	4		17
Qualification with the .45 Cal Pistol	4		17
Mechanical Training, M3A1 SMG	4		18
Engage Targets with M3A1 SMG	<u>4</u>		18
SUBANNEX TOTAL	34		
<b>Communications</b>		<b>B5</b>	<b>19</b>
Visual Signal	2		19
Operate and Communicate Using Tank			
Mounted Radios	3		19
Communications Procedures	<u>3</u>		19
SUBANNEX TOTAL	8		



Training Brigade, Cont'd.

	<u>Hours</u>	<u>Annex</u>	<u>Page</u>
<b>Fundamentals of the Soldier</b>		<b>B6</b>	<b>20</b>
Wearing of the Uniform	1		20
Customs and Courtesies	4		20
Personal Affairs	3		20
Hearing Orientation	1		20
Responsibility of the Soldier	1		20
Personal Values	1		21
Decision Making	1		21
Drill and Ceremonies	20		21
Guard Classes	4		21
Inspections	8		22
SUBANNEX TOTAL	44		
<b>Combat Skills and Tactics</b>		<b>B7</b>	<b>23</b>
Field Hygiene and Sanitation	1		23
Marches, Bivouacs and Field Living	6		23
SUBANNEX TOTAL	7		
<b>Physical Readiness Training</b>		<b>B8</b>	<b>24</b>
Physical Readiness Training	36		24
BPFT/APFT	7		24
Confidence Course	1		24
SUBANNEX TOTAL	44		
<b>Testing and Reinforcement Training</b>		<b>B9</b>	<b>25</b>
Reinforcement Training	28		25
Gate I Testing	8		25
Gate II Testing	8		25
Gate III Testing	8		25
SUBANNEX TOTAL	52		
<b>ANNEX TOTAL</b>	<b>459</b>		

#### SECTION IV - Annexes

##### Annex A - Committee Group

**Purpose:** To prepare the individual soldier to perform assigned job tasks at specific standards of proficiency. Committee Group subjects places emphasis on:

- a. Fundamentals of the soldier
- b. Combat skills and tactics
- c. Weapons

##### Subannex A1 - Fundamentals of the Soldier

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
CG.01001- Code of Conduct	1	1C

**Objective:** The student will become acquainted with the Code of Conduct and related articles in the UCMJ. The student will learn why the code was established and why it is important to the student as a member of the Armed Forces.

**Reference:** AR 350-30, DA Pam's 21-13, 360-522, UCMJ Articles 104-105.

CG.02002 - The Law of Land Warfare	2	2C
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**Objective:** The student from given factual situations will: identify violations of the law of war and indicate a lawful alternative action; identify errors made in handling prisoners and indicate what should have been done; and identify errors made in handling civilians and indicate what should have been done.

**Reference:** FM 27-10, Army Subject Schedule 27-1.

CG.03003 - Military Justice	3	3C
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**Objective:** The student will know his rights under the UCMJ. He will know the procedures and punishments involved in Article 15 proceedings and he will be made aware of offenses peculiar to the military. The student will be familiar with all procedures associated with all levels of military courts actions.

**Reference:** UCMJ, Manuals for Court Martials.

CG.04002 - Drug Abuse	2	2C
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**Objective:** The student will be informed of the Army's role in the Drug and Alcohol Abuse Prevention and Control Program, to include the prevention, identification, enforcement, and educational aspects of the program.

**Reference:** AR 500-21.

Subannex A1 (Cont'd.)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
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CG.05002 - Human Relations	2	2C
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Objective: The student will be informed of the Army's role in the Race Relations/Equal Opportunity Program.

Reference: FM 22-100, AR 600-21, AR 600-85.

CG.06001 - US Government and Freedom Under Law	1	1C
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Objective: The student will understand the principles of citizen's rights, expressed in the Declaration of Independence, and the checks and balances of the Constitution that prevent tyranny. He will learn that military service requires no sacrifice of constitutional rights.

Reference: DA Pam 355-140.

CG.07002 - VD Orientation/Birth Control	2	2C
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Objective: The student will be provided with the basic facts of venereal disease; its prevention, complications and courses of action to follow if contracted. The student will be informed of the various methods available to prevent unwanted pregnancies. He will learn why some married personnel practice contraception and why single personnel should practice contraception.

Reference: TB MED 230

SUBANNEX A1 TOTAL: 13

Subannex A2 - Combat Skills and Tactics

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
CG.10008 - First Aid	8	1C, 7PE
<p>Objective: Provided with a basic knowledge of first aid, the student will be capable of performing the fundamental techniques of shock prevention, bleeding control, treatment of fractures, burn treatment, mouth to mouth resuscitation, CPR and the Heimlich Maneuver.</p> <p>Reference: FM 21-11, 21-6.</p>		
CG.11005 - NBC Defense	5	1C, 4PE
<p>Objective: The student will discuss the NBC battlefield environment, NBC defense, and NBC reporting. He will understand reaction to NBC alarms and reaction to a nerve agent casualty, use of the atropine injector and the nerve agent antidote injector, care and cleaning of the M17 and M24, M25, or M25A1 protective masks, masking, undergo an NBC chamber exercise and understand personnel and personal equipment decontamination procedures.</p> <p>Reference: FM 3-10, 3-12, 21-40, 21-41, 21-48, TM 3-4240-280-10.</p>		
CG.12010 - Combat Orientation Course	12	2C, 2D, 8PE
<p>Objective: The student will demonstrate the four (4) basic principles of tactics, five (5) basic movement techniques, movement under indirect fire, night movement techniques; employ combat intelligence, react to flares, use challenge and password, and collect and report information (spot report).</p> <p>Reference: FM 21-75, 30-5, 22-6.</p>		
CG.13005 - Defensive Combat Course	5	1D, 4PE
<p>Objective: The student will be able to select a hasty defensive position, know the basic steps and techniques of preparing a two-man defensive position, be able to demonstrate the basic techniques of fighting from the position, construct an individual fighting position, and select an individual firing position.</p> <p>Reference: TC 7-50.</p>		
CG.14004 - Combat Weapons Course	4	1C, 1D, 2PE
<p>Objective: The student will place the LAW, M18A1 Claymore mine and M203 Grenade Launcher into operation. In addition, he will fire one (1) LAW subcaliber round.</p> <p>Reference: FM 71-1.</p>		

Subannex A2 (Cont'd)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
CG.15005 - Map Reading	5	2C, 3PE

Objective: The student will review techniques and solve problems involving marginal information, topographic symbols, expression of location, measurement of distance, evaluation of relief and use of direction.

Reference: FM 21-26.

CG.16006 - Opposing Forces Orientation	6	3C, 3PE
--	---	---------

Objective: The student will discuss current opposing forces organization and equipment, with emphasis on armored vehicles and antitank weapons of the motorized rifle and tank platoons, companies, battalions and reconnaissance elements and participate in a practical exercise set in a tactical environment of developing techniques of recognition and identification of various types of equipment including NATO and Warsaw pact vehicles.

Reference: ST 30-40-1 - Selected Soviet Equipment  
TC 30-102 - Motorized Rifle Company  
FM 30-103 - Opposing Forces Europe - Coordination Draft  
DDD 1100-77-76 - Soviet Motorized Company  
FM 30-40 - Handbook on Soviet Ground Forces

CG.17002 - Cover, Concealment and Camouflage	2	1C, 1PE
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Objective: The student will demonstrate techniques of cover and camouflage for himself and his individual equipment.

Reference:

SUBANNEX A2 TOTAL: 47

Subannex A3 - Weapons

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
CG.20002 - M16A1 Rifle, BRM 2	2	2PE

Objective: The student will learn shot analysis, placement of aiming point, sight alignment, eight (8) steady hold factors, and foxhole supported fighting position.

Reference: FM 23-9.

CG.20108 - M16A1 Rifle, BRM 3	8	IC, 7PE
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Objective: The student will learn principles of sight adjustments and effects of sight changes. He will review all factors of aiming to include importance of sight alignment, eight (8) steady hold factors, sight picture, shot group analysis and placement of aiming point. Student will learn and practice the target box/transposition exercise. Student will conduct 25 meter firing with nine (9) rounds while making sight changes. The student will learn to engage singular pop-up targets at the 75, 175, and 300 meter ranges while firing from the foxhole supported, prone unsupported and supported, and the kneeling supported and unsupported firing positions using 42 rounds of ammunition. Student will learn the center of target aiming technique, the optimum time to fire concept and learn to adjust his aiming point. The student will learn the principles of battlesight zeroing.

Reference: FM 23-9.

CG.21004 - Hand Grenades	4	0.5C, 0.5D, 3PE
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Objective: The student will learn the various types, uses, functions, and capabilities of hand grenades. He will conduct a mock bay exercise and throw two live fragmentation hand grenades.

Reference: FM 23-30.

CG.22002 - Mines	2	2C
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Objective: The student will become familiar with the types of mines and mine field markers used by armor units and methods of emplacement and recovery.

Reference: FM 4-20, 5-25, 5-34, 20-32.

SUBANNEX A3 TOTAL: 16  
ANNEX A TOTAL: 76

ANNEX B - \_\_\_\_\_ Training Brigade

**Purpose:** To prepare the individual soldier to perform assigned job tasks at specific standards of proficiency. \_\_\_\_\_ Training Brigade subjects place emphasis on:

- a. Driving
- b. Gunnery
- c. Maintenance and Miscellaneous Procedures
- d. Weapons
- e. Communications
- f. Fundamentals of the Soldier
- g. Combat Skills and Tactics
- h. Physical Readiness Training
- i. Testing and Reinforcement Training

Subannex B1 - Driving

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
DR.01016 - Driver Trainer	16	16PE

**Objective:** The student will demonstrate proficiency on all Driver Trainer procedure and driving programs.

**Reference:** Driver Trainer Literature.

DR.02008 - XM1 Tank Operations - Driver's Station	8	2D, 6PE
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**Objective:** The student will demonstrate safe entry and exit of the driver's station through the turret, cleaning of periscope lenses and servicing of periscope washer fluid reservoir, and procedures to unlock stuck parking brakes.

**Reference:** TM 9-2350-255-10.

Subannex B1 (Cont'd.)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
DE.01026 - Driving Exercises	26	2C, 24PE

Objective: The student will learn the characteristics of a firing position and how to use terrain in cover and concealment. He will move the vehicle so it is not exposed for more than 15 seconds, during daylight and darkness and in an NBC environment. He will select and occupy the best available firing position.

Reference: FM 5-20, 17-1, 17-12, 17-15.

SUBANNEX B1 TOTAL: 50



Subannex B2 - Gunnery

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
GC.01024 - XM1 Tank Operations - Loader's Station	24	5D, 19PE
<p><b>Objective:</b> The student will prepare the loader's station for operation and secure the loader's station. He will operate and maintain the periscope, elevation travel lock, turret traverse lock, loader's panel, and gas particulate filter system. He will perform pre and post firing checks. He will identify and stow ammunition and maintain the ammunition compartments. He will operate and maintain the main gun and loader's machinegun (dry fire), and maintain the grenade launcher and breechblock. He will prepare the main gun, loader's machinegun, and gunner's coax machinegun for travel.</p> <p><b>Reference:</b> TM 9-2350-255-10, TM 9-1005-313-10, FM 17-12.</p>		
GC.02064 - Unit-Conduct of Fire Trainer	64	64PE
<p><b>Objective:</b> The student will demonstrate proficiency on all U-COFT procedures and firing scenarios, in the gunner's station and in the commander's station.</p> <p><b>Reference:</b> Unit-Conduct of Fire Trainer Literature</p>		
GC.03012 - XM1 Tank Operations - Gunner's Station	12	2D, 10PE
<p><b>Objective:</b> The student will demonstrate safe entry and exit of the gunner's station. He will perform firing circuit checks and hydraulic zero pressure checks. He will operate and maintain the coax machinegun (dry fire). He will demonstrate immediate action procedures for malfunctions of the fire control system, main gun, and indicator lights.</p> <p><b>Reference:</b> TM 9-2350-255-10, TM 9-1005-313-10.</p>		
GC.04004 - XM1 Tank Operations - Commander's Station	4	1D, 3PE
<p><b>Objective:</b> The student will operate and maintain the commander's machinegun.</p> <p><b>Reference:</b> TM 9-2350-255-10, TM 9-1005-213-10.</p>		

Subannex B2 (Cont'd.)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
GE.01100 - Gunnery Exercises	100	100PE

**Objective:** The student will alternately serve as driver, loader, gunner, and tank commander in the conduct of Crew Drills and Crew Subcaliber Exercises.

**Reference:** FM 17-12, FM 17-12-1 (Draft), TC 17-15-14 (Draft).

SUBANNEX B2 TOTAL: 204

Subannex B3 - Maintenance and Miscellaneous Procedures

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
MC.01007 - Preventive Maintenance Checks and Services	7	1D, 6PE
Objective: The student will demonstrate before, during, and after operations preventive maintenance checks and services on the vehicle, hull, hull rear, and turret LAW TM 9-2350-255-10, Table 2-1.		
Reference: TM 9-2350-255-10, TM 9-2350-255-CL.		
TA.01001 - Fire Extinguishers	1	1C
Objective: The student will learn the location and operation of the portable fire extinguisher and the external fire extinguisher handle.		
Reference: TM 9-2350-255-10.		
TA.02002 - Water Fording Procedures	2	.5D, 1.5PE
Objective: The student will demonstrate procedures for all crewmembers to install water fording kit items and to prepare tank for operation after fording.		
Reference: TM 9-2350-255-10.		
TA.03001 - Infrared Lenses	1	.5D, .5PE
Objective: The student will demonstrate installation and removal of infrared lenses and learn safety procedures required for their use.		
Reference: TM 9-2350-255-10.		
TA.04001 - Decontaminate Tank	1	.5D, .5PE
Objective: The student will demonstrate steps in decontaminating a tank after nuclear attack.		
Reference: TM 3-220.		
TA.05002 - Lubricate Tank	2	.5D, 1.5PE
Objective: The student will learn the lubrication points, check oil levels, learn how to add or drain oil, and indicate frequency of oil changes and type of oil to be used. He will demonstrate these procedures as the need arises.		
Reference: LO 9-2350-255-12		

Subannex B3 (Con't)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
TA.06002 - Service Precleaner and Air Cleaner Filters	2	.5D, 1.5PE

Objective: The student will demonstrate procedures to clean sponson  
air intake grilles, clean precleaner and air cleaner filters.

Reference: TM 9-2350-255-10.

SUBANNEX B3 TOTAL: 16

Subannex B4 - Weapons

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
WC.01004 - Mechanical Training, M16A1 Rifle	4	1C, 3PE
Objective: The student will learn the nomenclature and characteristics of the M16A1 rifle, how to field strip, assemble, perform a function check, load and unload, clear, and perform immediate action on the weapon.		
Reference: FM 23-9, TM 9-1005-249-10.		
WC.02006 - Maintain the M16A1 Rifle	6	1C, 5PE
Objective: The student will field strip, clean, lubricate, perform functional check on the M16A1 rifle.		
Reference: FM 23-9.		
WC.03004 - Mechanical Training, .45 Cal Pistol	4	1C, 3PE
Objective: The student will load, unload, clear, disassemble, maintain, assemble, and perform immediate action on the .45 Cal pistol.		
Reference: FM 23-23.		
WC.04004 - Fundamentals of Firing Positions for the .45 Cal Pistol	4	4PE
Objective: The student will learn the basic positions for firing the .45 Cal pistol and the manual of arms.		
Reference: FM 23-23.		
WC.05004 - Preparatory Marksmanship Training	4	4PE
Objective: The student will fire the .45 Cal pistol preparatory marksmanship course.		
Reference: FM 23-23.		
WC.06004 - Qualification with the .45 Cal Pistol	4	4PE
Objective: The student will fire the .45 Cal pistol for qualification IAW FM 23-25.		
Reference: FM 23-25.		

Subannex B4 (Con't)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
WC.07004 - Mechanical Training M3A1 SMG	4	1C, 3PE

Objective: The student will load, unload, clear, disassemble, maintain, assemble and perform immediate action on the M3A1 SMG.

Reference: FM 23-23.

WC.08004 - Engage Targets with M3A1 SMG	4	0.5C, 3.5PE
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Objective: The student will fire the M3A1 SMG for familiarization/qualification firing.

Reference: FM 23-41.

SUBANNEX B4 TOTAL: 34

Subannex B5 - Communications

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
CM.01002 - Visual Signal	2	1C, 1PE

Objective: The student will communicate using hand and arm signals, flashlight and/or flag set.

Reference: FM 21-60.

CM.02004 - Operate and Communicate Using		
CM.03004 Tank Mounted Radios	3	1C, 2PE

Objective: The student will operate radio sets through their associated intercommunications system in a simulated tactical voice radio net using radiotelephone procedures.

Reference: TM 11-5820-498-12.

CM.04004 - Communications Procedures	3	1C, 2PE
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Objective: The student will perform operator's maintenance on tactical FM radios and accessories. The student will transmit messages over a radio net.

Reference: TM 11-5820-498-12, FM 24-18.

SUBANNEX B5 TOTAL: 8

Subannex B 6 - Fundamentals of the Soldier

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
AA.02001 - Wearing of the Uniform	1	1C
<p>Objective: The student will learn the proper wearing of the uniform and learn how to differentiate rank when confronted by individuals wearing the various uniforms of the United States Army.</p> <p>Reference: AR 670-6, 670-5-2, FM 21-6.</p>		
AA.03004 - Customs and Courtesies	4	4C
<p>Objective: The student will develop and foster an awareness and appreciation for the traditions, customs, and courtesies of the Army and the soldier's role and expectations in upholding this heritage.</p> <p>Reference: AR 600-20, 600-25, FM 21-5, 21-6, 21-13, 22-5, DA Pam's 350-43, 672-2.</p>		
AA.05001 - Personal Affairs	3	3C
AA.06001		
AA.07001		
<p>Objective: The student will learn the obligations that the Army expects him to meet and/or establish in the conduct of his personal affairs i.e., check cashing policies, proper use of military facilities and equipment that are available for him and his needs.</p> <p>Reference: AR 600-33, DA Pam 16-6.</p>		
BB.03001 - Hearing Orientation	1	1C
<p>Objective: The student will receive instructions, methods and devices to protect him from hearing loss and to make him aware of hearing hazards.</p> <p>Reference: Local Policy.</p>		
BB.06001 - Responsibility of the Soldier	1	1C
<p>Objective: The student will develop basic understanding of what responsibility is, how it is developed, why it is necessary, and how it relates to him as a citizen and a soldier.</p> <p>Reference: AR 600-33, FM 21-6, 12-13, 22-100, and DA Pam 16-6.</p>		



Subannex B6 (Con't)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
BB.07001 - Personal Values	1	1C
<p><b>Objective:</b> The student will be helped to recognize and appreciate basic human values stressing the application of those values in one's individual life as well as the life of the community.</p> <p><b>Reference:</b> Local Policy.</p>		
BB.08001 - Decision Making	1	1C
<p><b>Objective:</b> The student will conduct himself in accordance with what he knows to be morally sound principles. He will understand the difficulties and basis of making decisions.</p> <p><b>Reference:</b> AR 600-30, FM 16-5, Appropriate Ethical Sources.</p>		
DC.010 - Drill and Ceremonies thru DC.100 and MA.010 MA.020	20	20PE
<p><b>Objective:</b> The student will learn the skills required to participate in drill and ceremonies conducted in 12 separate units of instruction. He will participate in at least one reveille and one retreat ceremony.</p> <p><b>Reference:</b> FM 22-5.</p>		
GD.01001 - Guard Classes GD.02001 GD.03001 GD.04001	4	4PE
<p><b>Objective:</b> The student will learn the proper methods for conducting both an exterior and interior guard post and the general and special orders connected with Guard Duty.</p> <p><b>Reference:</b> FM 22-6.</p>		

Subannex B6 (Con't)

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
IN.01002 - Inspections	8	8PE
IN.02002		
IN.03002		
IN.04002		

Objective: The student will learn maintenance, display, and care of individual and organizational clothing and equipment. He will stand a working inspection by his Drill Sergeant, a stand by and in-ranks inspection by his Company Commander, and a class A inspection by his Battalion Commander.

Reference: FM 21-13, 21-15.

SUBANNEX B6 TOTAL: 44

Subannex B7 - Combat Skills and Tactics

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
AA.04001 - Field Hygiene and Sanitation	1	0.5C, 0.5D

Objective: The student will be able to describe personal hygiene devices, discuss two means of purifying his own water supply, discuss proper method of inspecting clothing and boots for proper fit, discuss the correct use of mosquito netting, the employment of insect sprays, the application of insect repellents, discuss the "chain of transmission" of disease, and clean individual mess equipment.

Reference: FM 21-10.

MB.01002 - Marches, Bivouacs and		
MB.02004 Field Living	6	6PE

Objective: The student will be proficient in living in the field in a tactical situation. He will use techniques of camouflage, light and noise discipline, dispersion, and local security.

Reference: FM 21-10, 21-18, 21-75, DA Pam 350-43.

SUBANNEX B7 TOTAL: 7

Subannex B8 - Physical Readiness Training

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
PT.010 - Physical Readiness Training thru PT.180	36	36PE

Objective: The student will participate in physical conditioning drills and exercises to prepare and improve body physical fitness. Training is conducted in 18 blocks, one of which is team athletics.

Reference: FM 21-10, 35-20.

PT.140 - BPFT/APFT PT.150	7	7E
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Objective: The student will demonstrate his physical fitness by achieving a passing score on the physical fitness test.

Reference: FM 21-10, 35-20, AR 600-9, DA Pam's 21-1, 21-2, USAARMS Reg 350-1, 28-1.

PT.16001 - Confidence Course	1	1PE
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Objective: The student will traverse the confidence course.

Reference: FM 21-10, 35-20.

SUBANNEX B8 TOTAL: 44

**Subannex B9 - Testing and Reinforcement Training**

<u>File No.</u>	<u>Hours</u>	<u>Type of Instruction</u>
RT.01028 - Reinforcement Training	28	28PE

**Objective:** The student will review all previously presented materials in preparation for the Gate I, Gate II and the Gate III tests.

**Reference:** All appropriate references.

TG.01008 - Gate I Testing	8	8E
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**Objective:** The student will demonstrate his proficiency in all training to date. The test includes reporting procedures and appropriate greetings rendered to officers and NCO's. The student will demonstrate appropriate honors to the flag and actions during the National Anthem, and demonstrate proficiency in drill and ceremonies.

**Reference:** All appropriate references.

TG.02008 - Gate II Testing	8	8E
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**Objective:** The student will demonstrate proficiency in all procedures contained in Subannexes B3 through B5, and B7: maintenance and miscellaneous procedures, weapons, communications, and combat skills and tactics.

**Reference:** All appropriate references.

TG.03008 - Gate III Testing	8	8E
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**Objective:** The student will perform basic skills required for qualification as an XM1 Armor Crewman.

**Reference:** All appropriate references.

**SUBANNEX B9 TOTAL: 52**

**ANNEX TOTAL: 459**

# SECTION V - Ammunition Requirements

Course: 19K10-OSUT, XM1 Armor Crewman Course

FILE NO.		PAGE NO.		PER SOLDIER	PER DEMO
CG.12010	Combat Orientation Course	8	Smoke Grenade, Green		10
			Smoke Grenade, Yellow		10
			Illum. Signal, Green		
			Star		34
			Illum. Signal, Red		
			Star		5
			Illum. Signal, W.S.P.		58
			Trip Flare		48
			Ground Burst Simulator		30
CG.13005	Defensive Combat Course	8	Ctg, 5.56mm (blank)	21	20
CG.14004	Combat Weapons Course	8	RKT, 35mm Practice M27A1 (LAW)	1	1
CG.20108	M16A1 Rifle, BRM 3	10	Ctg, 5.56mm	78	
CG.21004	Hand Grenades	10	Hand Grenade	2	
GE.01100	Gunnery Exercise	14	Ctg, 7.62mm	1500	
			Ctg, Cal .50	500	
			Subcaliber	182	
WC.06004	Qualification with .45 Cal Pistol	17	Ctg, Cal .45	40	100
WC.08004	Engage Targets with M3A1 SMG	18	Ctg, Cal .45	135	15

APPENDIX F  
PERFORMANCE-ORIENTED INSTRUCTION  
AND TESTING

## BASIC PRINCIPLES OF PERFORMANCE-ORIENTED INSTRUCTION<sup>1</sup>

1. Present only the information the soldier must know to perform the task adequately and safely.
  - a. This means that you must tell the soldier only what he must do and how to do it adequately and safely.
2. Present the essential "how to" information only when the soldier needs it for task performance, a step at a time.
  - a. This means that you must avoid showing and explaining how to perform a task before he has a chance to use the information. The reason for avoiding this is that the soldier won't remember your instructions, and you must give it all to him again when he has a chance to perform. This wastes much time.
3. Require the soldier to apply the "how to" information immediately in "hands on" task performance.
  - a. This means that the soldier must do (or say) what you do (or say) as soon as possible after you demonstrate and explain how to perform a step, and you must see that he does it, not just watch and listen.
  - b. Requiring the soldier to apply the information in "hands on" performance puts an important responsibility on the trainer. That responsibility is to establish situations during practice periods that will cause the soldier to learn how to perform a task. Here, there is one important thing to watch for. What you prepare for the soldier to do as a practical exercise will depend primarily on the type of job task he is to learn. In most cases the practical exercise situation will be straightforward as you will be working with a task in which the conditions, procedure and outcome never vary. The soldier will repeatedly work with the same information, practice the same procedure and attempt to achieve the same outcome each practice trial. In these cases you will simply have him practice the procedure until he can do it correctly. In other cases the basic procedure in performing a task will not change, but certain given conditions or information govern the outcome of task performance. So, when you are preparing the practice session, be sure to consider the type of task to be learned--is it the type that must be practiced under different conditions or with different information given, or must the procedure be practiced under the same conditions and with the same information each time.

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<sup>1</sup>Based on Osborn, W.C., Ford, J.P., Moon, H.L., Campbell, R.C., Root, R.L., and Ward, L.E. Course Outline: Instruction for Unit Trainers in How to Conduct Performance Training. Human Resources Research Organization (HumRRO), Final Report (FR-CD-L-75-3), 1975.



4. Permit each soldier to learn each step and develop his skill at his own pace.
  - a. This principle allows a soldier to practice as little or as much as he needs to develop a skill.
  - b. Fast learners can be tested (checked out) while slower learners are still developing their skill. Fast learners can then be assigned to help the slower learners who need help. This can make the job of an instructor much easier and speed up the training. One note of caution: if peer instructors are used be sure they apply the principles of performance training and demonstrating that you have applied.
5. Aid soldiers' learning by coaching them.
  - a. Coaching involves four things:
    - (1) Telling or showing a soldier as many times as necessary for him to learn something difficult.
    - (2) Prompting recall of what to do next, or of how to do something, by asking questions.
    - (3) Preventing a soldier from doing something wrong. It is better to prevent an error, if possible, than to have a soldier correct it, especially if the error would cause personal injury or equipment damage.
    - (4) Reinforcing correct performance by assuring the soldier that he is doing something correctly. When you tell a soldier he is doing it right, he is encouraged to try harder and he learns faster. Unfortunately, many instructors either fail to give positive reinforcement or fail to give it as often as they should.
  - b. One thing should be remembered about coaching: the soldier is the one who should be practicing, not you. If you show him how to do a step in a task, return the equipment to its previous condition so he can do that part of the task.
6. Establish quality control by reliably administering performance tests. Training is effective if the soldiers are able to perform the task to the level specified in the task analysis by the training objective. Performance tests are the tools to help you determine whether the objectives have been mastered.

## GUIDANCE FOR CONDUCTING PERFORMANCE-ORIENTED INSTRUCTION

### 1. Prepare to demonstrate the task.

- a. Obtain the training objective and performance test. You must have the performance test to adequately check student performance after training.

Check the objective carefully. This tells you exactly what the soldier must do or tell you he would do.

Insure you can perform the task.

- b. Identify all acts and key (critical) points in performance of the task.

Perform the task and pay careful attention to everything you do, regardless of how small an act may be, and ask yourself why you do everything you do. This will enable you to explain it to the soldiers.

Note all possibilities for injury of self or others and how to avoid them.

Note all possibilities for damage to equipment or materials and how to avoid them.

Note all acts that must be done in sequence for task performance.

Note all specific acts that must be done at certain points to make the task easier.

Note all conditions of equipment or materials at certain points to make the task easier.

- c. Prepare the set-up for demonstration so that everyone can clearly see and hear you.

Position equipment and materials so soldiers can see the demonstration as they will when they are performing the task.<sup>1</sup>

Assure that soldiers are placed so they can see you.

When appropriate, provide soldiers with job aids, such as procedural checklists, troubleshooting routines, or manuals.

### 2. Orient students to the equipment and materials and to the task.

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<sup>1</sup>This may be very difficult for the driver tasks in the XM1 because the driver's station is so confining. Soldiers may not be able to observe all of your demonstration. In fact, you may decide to de-emphasize demonstrations and begin with a soldier in place while you talk him through the first few trials.

3. Briefly identify the equipment and materials and state their purpose, if necessary. Do not give "nice-to-know" information, such as historical background, technical characteristics, or how it does what it does.
4. Precisely state the training objective and tell soldiers exactly what they must be able to do upon the completion of training on that task.
5. Demonstrate and explain the task to be learned.
  - a. Emphasize that they must perform the task as you will demonstrate it to them.
  - b. Show and explain one step at a time in accordance with the training objective.
  - c. Identify for the soldier the part or parts you will work with or on in each step.
  - d. Speak loud enough to be heard.
  - e. Speak to be understood; that is, speak deliberately and use non-technical terms.
  - f. Strongly emphasize each key (critical) point you have noted in your analysis of the task. Don't just mention them; emphatically call attention to them.
  - g. Explain why a step must be performed in a particular way-- to prevent personal injury or equipment damage, or to avoid unnecessary difficulty in performing the step.
6. Make what you do clearly visible from the soldiers' viewpoint.
  - a. The "soldiers' viewpoint" is (or very nearly) the direction in which the soldier will see his hands and what he will work with or on when performing the task.
  - b. If precisely what you do must be hidden from view, carefully show what you will be working on and carefully explain how you will perform so that their mental imagery can give them some idea of the precise action.
7. After demonstrating and explaining each step, ask for and answer relevant questions, but defer irrelevant questions.
  - a. When soldiers ask questions relevant to performance of a step, answer them by carefully showing and explaining again what they want to know.
8. When appropriate, demonstrate alternate procedures for performing a task under different conditions.
  - a. An example is a modified procedure for performing a task at night, rather than in daytime.
  - b. Alternate procedures, if much different, should be taught after the basic (usual) procedure has been mastered.

9. Conduct the walk-through phase. (If task is simple, this phase may not be needed. If the task is difficult, several repetitions may be necessary.)
  - a. Pace the walk-through by telling the soldier when to perform each step.
  - b. Explain how to perform the step and observe performance.
  - c. Coach those who have difficulty.
  - d. Reinforce correct performance by saying, "That's right," "Good," "Fine," or the like.
10. Supervise practice.
  - a. Require soldiers to perform without your telling them when and how to perform each step, unless individuals need help.
  - b. Coach those who need help.
  - c. Reinforce correct performance by letting them know they are doing well.
  - d. Qualify, assign and supervise peer (assistant) instructors.
    1. If the task is relatively simple, you will recognize fast learners whom you can assign as peer instructors to aid one or more slow learners.
    2. If task is difficult or dangerous, qualify the fast learners by asking them "smoke out" questions about key points to be sure they understand: "Why do you do that?" What would happen if . . .?" "How can you be sure that . . .?"
    3. If soldiers are in small groups, the first one to walk through probably can qualify as the assistant.
    4. You must observe peer instructors to be sure that they are prompting and coaching correctly.
  - e. When soldiers have learned the task procedure, instruct them to practice to develop skill and speed,
  - f. Remind them of the performance standard and time limitation of task performance.
  - g. Instruct soldiers to let you know when he thinks he is ready for check-out (testing) on the task(s).

11. Administer performance tests.

Each performance test will have four major parts:

- . Performance measures, which consist of actions that the soldier must perform or specifications of the product of correct performance. Each performance measure is scored as Pass or Fail during the test, and a pre-determined number of performance measures must be scored Pass (normally all) for the soldier to receive a GO on the test.
- . Test conditions, which include acceptable environmental conditions, equipment, tools, and manuals required, and test set-up.
- . Instructions to the soldier, consisting at a minimum of the task statement, including any special information on where the soldier is to start and complete the task if the full task is not to be performed.
- . Instructions to the test administrator, telling him how to set up the test, how to handle each soldier during the test, where to position himself to be able to observe the soldier, and any special instructions on how to score.

APPENDIX G

GUNNERY OBJECTIVES FOR REVIEW  
OF OSUT MATERIAL

FIRE DELIVERY METHOD: NORMAL PRECISION

ENGAGEMENT CATEGORY: 2  
OBJECTIVE: 2A

OWN TANK						
WEAPON	TANK MOTION		TURRET		CONTROLS	
MG <u>+</u>	M <u>+</u>		STAB <u>+</u>		POWER <u>+</u>	
COAX <u>—</u>	S <u>—</u>		NONSTAB <u>—</u>		MANUAL <u>—</u>	
.50 CAL <u>—</u>						
	GPS	TIS	LRF	LEAD	CROSSWIND	CANT
FUNCTION	<u>—</u>	<u>+</u>	<u>+</u>	<u>+</u>	<u>+</u>	<u>+</u>
MALFUNCTION	<u>+</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M <u>+</u>	SINGLE <u>+</u>	MED (500-1500) <u>—</u>	VIS <u>—</u>
S <u>—</u>	SIMUL <u>—</u>	LONG (1501-3000) <u>+</u>	VIS/TIS <u>+</u>
	MULT <u>—</u>		

## CRITERIA

## TIME (Seconds)

Main Gun Engagements

	TC	GNR
From target exposure to start of initial fire command:	<u>—</u>	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>	<u>—</u>
From Gunner "Identify" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From Gunner "Not Identified" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From TC "Fire" to first round fired:	<u>—</u>	<u>—</u>
From TC completion of lase to first round fired:	<u>—</u>	<u>—</u>
From first round impact to second round fired (if first round miss):	<u>—</u>	<u>—</u> or <u>—</u>

.50 Caliber Engagements

From target exposure to target suppression:

Coax Engagements

From target exposure to start of fire command:	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>
From Gunner "Identify" to select coax, lay, track:	<u>—</u>
From finish of tracking to target suppression:	<u>—</u>

## AIMING ERROR

Dry Fire-Main Gun

	First Round	Second Round
Deflection error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Elevation error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Deflection error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils
Elevation error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils

Live Fire-Main Gun, Coax, .50 Caliber

	Rounds
Main Gun	<u>—</u>
Coax	<u>—</u>
.50 Caliber	<u>—</u>

FIRE DELIVERY METHOD: NORMAL PRECISION

ENGAGEMENT CATEGORY: 3

OBJECTIVE: 3A

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	+	M	+	STAB	+	POWER
COAX	—	S	—	NONSTAB	—	MANUAL
.50 CAL	—					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION	+					
MALFUNCTION	—	+	—	—	—	—

TARGET				
TGT MOTION	TGT NUMBER	RANGE	VIS	
M	+	SINGLE	MED (500-1500)	+
S	—	SIMUL	LONG (1501-3000)	+
		MULT		+
				+

## CRITERIA

## TIME (Seconds)

## Main Gun Engagements

	TC	GNR
From target exposure to start of initial fire command:	—	—
From start of fire command to finish of lay for direction:	—	—
From Gunner "Identify" to select ammo, lay, track, and lase:	—	—
From Gunner "Not Identified" to select ammo, lay, track, and lase:	—	—
From TC "Fire" to first round fired:	—	—
From TC completion of lase to first round fired:	—	—
From first round impact to second round fired (if first round miss):	—	or —

## .50 Caliber Engagements

From target exposure to target suppression: —

## Coax Engagements

From target exposure to start of fire command:	—	
From start of fire command to finish of lay for direction:	—	
From Gunner "Identify" to select coax, lay, track:		—
From finish of tracking to target suppression:		—

## AIMING ERROR

## Dry Fire-Main Gun

	First Round	Second Round
Deflection error from center of mass (Precision):	— mils	— mils
Elevation error from center of mass (Precision):	— mils	— mils
Deflection error from base of target (Battlesight):	— mils	— mils
Elevation error from base of target (Battlesight):	— mils	— mils

## Live Fire-Main Gun, Coax, .50 Caliber

	Rounds
Main Gun	—
Coax	—
.50 Caliber	—



FIRE DELIVERY METHOD: EMERGENCY PRECISION

ENGAGEMENT CATEGORY: 11

OBJECTIVE: 11C

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	+	M	—	STAB	—	POWER
COAX	—	S	+	NONSTAB	+	MANUAL
.50 CAL	+					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION	+	—	—	+	—	+
MALFUNCTION	—	+	—	+	—	—

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M	+	MED (500-1500)	+
S	+	LONG (1501-3000)	+
	(.50 CAL)		
	SINGLE		
	SIMUL		
	MULT		
			VIS/TIS

## CRITERIA

## TIME (Seconds)

## Main Gun Engagements

From target exposure to start of initial fire command:  
 From start of fire command to finish of lay for direction:  
 From Gunner "Identify" to select ammo, lay, track, and lase:  
 From Gunner "Not Identified" to select ammo, lay, track, and lase:  
 From TC "Fire" to first round fired:  
 From TC completion of lase to first round fired:  
 From first round impact to second round fired (if first round miss):

TC GNR

or

## .50 Caliber Engagements

From target exposure to target suppression:

## Coax Engagements

From target exposure to start of fire command:  
 From start of fire command to finish of lay for direction:  
 From Gunner "Identify" to select coax, lay, track:  
 From finish of tracking to target suppression:

## AIMING ERROR

## Dry Fire-Main Gun

Deflection error from center of mass (Precision):  
 Elevation error from center of mass (Precision):  
 Deflection error from base of target (Battlesight):  
 Elevation error from base of target (Battlesight):

First Round

Second Round

\_\_\_\_\_ mils \_\_\_\_\_ mils  
 \_\_\_\_\_ mils \_\_\_\_\_ mils  
 \_\_\_\_\_ mils \_\_\_\_\_ mils  
 \_\_\_\_\_ mils \_\_\_\_\_ mils

## Live Fire-Main Gun, Coax, .50 Caliber

Rounds

Main Gun  
 Coax  
 .50 Caliber

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

FIRE DELIVERY METHOD: MANUAL BATTLESIGHT

ENGAGEMENT CATEGORY: 16

OBJECTIVE: 16B

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	+	M	—	STAB	—	POWER
COAX	—	S	+	NONSTAB	+	MANUAL
.50 CAL	—					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION						CANT
MALFUNCTION		+	+	+	+	+

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M	+	SINGLE	—
S	—	SIMUL	—
		MULT	+
		MED (500-1500)	+
		LONG (1501-3000)	+
		VIS	+
		VIS/TIS	—

## CRITERIA

TIME (Seconds)Main Gun Engagements

From target exposure to start of initial fire command: \_\_\_\_\_

From start of fire command to finish of lay for direction: \_\_\_\_\_

From Gunner "Identify" to select ammo, lay, track, and lase: \_\_\_\_\_

From Gunner "Not Identified" to select ammo, lay, track, and lase: \_\_\_\_\_

From TC "Fire" to first round fired: \_\_\_\_\_

From TC completion of lase to first round fired: \_\_\_\_\_

From first round impact to second round fired (if first round miss): \_\_\_\_\_ or \_\_\_\_\_

.50 Caliber Engagements

From target exposure to target suppression: \_\_\_\_\_

Coax Engagements

From target exposure to start of fire command: \_\_\_\_\_

From start of fire command to finish of lay for direction: \_\_\_\_\_

From Gunner "Identify" to select coax, lay, track: \_\_\_\_\_

From finish of tracking to target suppression: \_\_\_\_\_

AIMING ERRORDry Fire-Main Gun

Deflection error from center of mass (Precision): \_\_\_\_\_

Elevation error from center of mass (Precision): \_\_\_\_\_

Deflection error from base of target (Battlesight): \_\_\_\_\_

Elevation error from base of target (Battlesight): \_\_\_\_\_

First RoundSecond Round

\_\_\_\_\_ mils \_\_\_\_\_ mils

\_\_\_\_\_ mils \_\_\_\_\_ mils

\_\_\_\_\_ mils \_\_\_\_\_ mils

\_\_\_\_\_ mils \_\_\_\_\_ mils

Live Fire-Main Gun, Coax, .50 CaliberRounds

Main Gun

Coax

.50 Caliber

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

FIRE DELIVERY METHOD: NORMAL PRECISION

ENGAGEMENT CATEGORY: 17

OBJECTIVE: 17C

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	_____	M	_____	STAB	+	POWER
COAX	+	S	+	NONSTAB	_____	MANUAL
.50 CAL	+					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION	+	+	_____	+	+	+
MALFUNCTION	_____	_____	+	_____	_____	_____

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M	+	MED (500-1500)	+
S	+	LONG (1501-3000)	+
			VIS/TIS
	SINGLE	_____	_____
	SIMUL	+	_____
	MULT	_____	_____

## CRITERIA

## TIME (Seconds)

## Main Gun Engagements

	TC	GNR
From target exposure to start of initial fire command:	_____	_____
From start of fire command to finish of lay for direction:	_____	_____
From Gunner "Identify" to select ammo, lay, track, and lase:	_____	_____
From Gunner "Not Identified" to select ammo, lay, track, and lase:	_____	_____
From TC "Fire" to first round fired:	_____	_____
From TC completion of lase to first round fired:	_____	_____
From first round impact to second round fired (if first round miss):	_____	or _____

## .50 Caliber Engagements

From target exposure to target suppression:

## Coax Engagements

From target exposure to start of fire command:	_____	_____
From start of fire command to finish of lay for direction:	_____	_____
From Gunner "Identify" to select coax, lay, track:	_____	_____
From finish of tracking to target suppression:	_____	_____

## AIMING ERROR

## Dry Fire-Main Gun

	First Round	Second Round
Deflection error from center of mass (Precision):	_____ mils	_____ mils
Elevation error from center of mass (Precision):	_____ mils	_____ mils
Deflection error from base of target (Battlesight):	_____ mils	_____ mils
Elevation error from base of target (Battlesight):	_____ mils	_____ mils

## Live Fire-Main Gun, Coax, .50 Caliber

	Rounds
Main Gun	_____
Coax	_____
.50 Caliber	_____

FIRE DELIVERY METHOD: Normal Precision

ENGAGEMENT CATEGORY: 19

OBJECTIVE: 19B

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	<u>+</u>	M	<u>+</u>	STAB	<u>+</u>	POWER <u>+</u>
COAX	<u>—</u>	S	<u>—</u>	NONSTAB	<u>—</u>	MANUAL <u>—</u>
.50 CAL	<u>—</u>					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION	<u>+</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>+</u>	<u>+</u>
MAFUNCTION	<u>—</u>	<u>+</u>	<u>+</u>	<u>—</u>	<u>—</u>	<u>—</u>

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M <u>+</u>	SINGLE <u>—</u>	MED (500-1500) <u>+</u>	VIS <u>—</u>
S <u>+</u>	SIMUL <u>—</u>	LONG (1501-3000) <u>+</u>	VIS/TT <u>—</u>
	MULT <u>+</u>		

## CRITERIA

## TIME (Seconds)

## Main Gun Engagements

	TC	GNR
From target exposure to start of initial fire command:	<u>—</u>	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>	<u>—</u>
From Gunner "Identify" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From Gunner "Not Identified" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From TC "Fire" to first round fired:	<u>—</u>	<u>—</u>
From TC completion of lase to first round fired:	<u>—</u>	<u>—</u>
From first round impact to second round fired (if first round miss):	<u>—</u>	<u>—</u> or <u>—</u>

## .50 Caliber Engagements

From target exposure to target suppression:

## Coax Engagements

From target exposure to start of fire command:	<u>—</u>	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>	<u>—</u>
From Gunner "Identify" to select coax, lay, track:	<u>—</u>	<u>—</u>
From finish of tracking to target suppression:	<u>—</u>	<u>—</u>

## AIMING ERROR

## Dry Fire-Main Gun

	First Round	Second Round
Deflection error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Elevation error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Deflection error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils
Elevation error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils

## Live Fire-Main Gun, Coax, .50 Caliber

## Main Gun

## Coax

## .50 Caliber

## Rounds

—  
—  
—

FIRE DELIVERY METHOD: Normal Battlesight

ENGAGEMENT CATEGORY: 24  
OBJECTIVE: 24A

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	+	M	+	STAB	+	POWER
COAX	—	S	—	NONSTAB	—	MANUAL
.50 CAL	—					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION		—	+	—	+	—
MALFUNCTION		+	—	+	—	+

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M	+		
S	—		
	SINGLE	MED (500-1500)	+
	SIMUL	LONG (1501-3000)	+
	MULT		+
			VIS
			VIS/TIS

### CRITERIA

#### TIME (Seconds)

Main Gun Engagements	TC	GNR
From target exposure to start of initial fire command:	—	—
From start of fire command to finish of lay for direction:	—	—
From Gunner "Identify" to select ammo, lay, track, and lase:	—	—
From Gunner "Not Identified" to select ammo, lay, track, and lase:	—	—
From TC "Fire" to first round fired:	—	—
From TC completion of lase to first round fired:	—	—
From first round impact to second round fired (if first round miss):	—	or —
<u>.50 Caliber Engagements</u>		
From target exposure to target suppression:	—	—
<u>Coax Engagements</u>		
From target exposure to start of fire command:	—	—
From start of fire command to finish of lay for direction:	—	—
From Gunner "Identify" to select coax, lay, track:	—	—
From finish of tracking to target suppression:	—	—

#### AIMING ERROR

Dry Fire-Main Gun	First Round	Second Round
Deflection error from center of mass (Precision):	— mils	— mils
Elevation error from center of mass (Precision):	— mils	— mils
Deflection error from base of target (Battlesight):	— mils	— mils
Elevation error from base of target (Battlesight):	— mils	— mils
<u>Live Fire-Main Gun, Coax, .50 Caliber</u>		
	Rounds	
Main Gun	—	
Coax	—	
.50 Caliber	—	

FIRE DELIVERY METHOD: Normal Battlesight

ENGAGEMENT CATEGORY: 25

OBJECTIVE: 25C

OWN TANK						
WEAPON		TANK MOTION		TURRET		CONTROLS
MG	+	M	+	STAB	+	POWER
COAX	+	S	—	NONSTAB	—	MANUAL
.50 CAL	—					
		GPS	TIS	LRF	LEAD	CROSSWIND
FUNCTION		+	+	—	—	+
MALFUNCTION		—	—	+	+	—

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M	SINGLE	MED (500-1500)	+
S	SIMUL	LONG (1501-3000)	+
	MULT		+
			VIS
			VIS/TIS

## CRITERIA

TIME (Seconds)	TC	GNR
<u>Main Gun Engagements</u>		
From target exposure to start of initial fire command:	—	
From start of fire command to finish of lay for direction:	—	
From Gunner "Identify" to select ammo, lay, track, and lase:	—	—
From Gunner "Not Identified" to select ammo, lay, track, and lase:	—	—
From TC "Fire" to first round fired:	—	—
From TC completion of lase to first round fired:	—	—
From first round impact to second round fired (if first round miss):	—	or —
<u>.50 Caliber Engagements</u>		
From target exposure to target suppression:	—	
<u>Coax Engagements</u>		
From target exposure to start of fire command:	—	
From start of fire command to finish of lay for direction:	—	
From Gunner "Identify" to select coax, lay, track:	—	—
From finish of tracking to target suppression:	—	—
<u>AIMING ERROR</u>		
<u>Dry Fire—Main Gun</u>	<u>First Round</u>	<u>Second Round</u>
Deflection error from center of mass (Precision):	— mils	— mils
Elevation error from center of mass (Precision):	— mils	— mils
Deflection error from base of target (Battlesight):	— mils	— mils
Elevation error from base of target (Battlesight):	— mils	— mils
<u>Live Fire—Main Gun, Coax, .50 Caliber</u>	<u>Rounds</u>	
Main Gun	—	
Coax	—	
.50 Caliber	—	

FIRE DELIVERY METHOD: Emergency Precision

ENGAGEMENT CATEGORY: 28  
OBJECTIVE: 28B

OWN TANK						
WEAPON	TANK MOTION		TURRET		CONTROLS	
MG	M		STAB		POWER	+
COAX	S	+	NONSTAB	+	MANUAL	
.50 CAL						
	GPS	TIS	LRF	LEAD	CROSSWIND	CANT
FUNCTION		+			+	+
MALFUNCTION	+		+	+		

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M +	SINGLE	MED (500-1500)	+
S + (.50 Cal)	SIMUL +	LONG (1501-3000)	
	MULT		VIS/TIS +

## CRITERIA

TIME (Seconds)Main Gun Engagements

	TC	GNR
From target exposure to start of initial fire command:	_____	_____
From start of fire command to finish of lay for direction:	_____	_____
From Gunner "Identify" to select ammo, lay, track, and lase:	_____	_____
From Gunner "Not Identified" to select ammo, lay, track, and lase:	_____	_____
From TC "Fire" to first round fired:	_____	_____
From TC completion of lase to first round fired:	_____	_____
From first round impact to second round fired (if first round miss):	_____	_____ or _____

.50 Caliber Engagements

	TC	GNR
From target exposure to target suppression:	_____	_____

Coax Engagements

	TC	GNR
From target exposure to start of fire command:	_____	_____
From start of fire command to finish of lay for direction:	_____	_____
From Gunner "Identify" to select coax, lay, track:	_____	_____
From finish of tracking to target suppression:	_____	_____

AIMING ERRORDry Fire-Main Gun

	First Round	Second Round
Deflection error from center of mass (Precision):	_____ mils	_____ mils
Elevation error from center of mass (Precision):	_____ mils	_____ mils
Deflection error from base of target (Battlesight):	_____ mils	_____ mils
Elevation error from base of target (Battlesight):	_____ mils	_____ mils

Live Fire-Main Gun, Coax, .50 Caliber

	Rounds
Main Gun	_____
Coax	_____
.50 Caliber	_____

FIRE DELIVERY METHOD: Emergency Battlesight

ENGAGEMENT CATEGORY: 30

OBJECTIVE: 30B

OWN TANK						
WEAPON	TANK MOTION		TURRET		CONTROLS	
MG <u>+</u>	M <u>—</u>		STAB <u>—</u>		POWER <u>+</u>	
COAX <u>—</u>	S <u>+</u>		NONSTAB <u>+</u>		MANUAL <u>—</u>	
.50 CAL <u>—</u>						
	GPS	TIS	LRF	LEAD	CROSSWIND	CANT
FUNCTION	<u>+</u>	<u>+</u>	<u>—</u>	<u>—</u>	<u>+</u>	<u>+</u>
MAFUNCTION	<u>—</u>	<u>—</u>	<u>+</u>	<u>+</u>	<u>—</u>	<u>—</u>

TARGET			
TGT MOTION	TGT NUMBER	RANGE	VIS
M <u>+</u>	SINGLE <u>+</u>	MED (500-1500)	VIS
S <u>—</u>	SIMUL <u>—</u>	LONG (1501-3000) <u>+</u>	VIS/TIS <u>+</u>
	MULT <u>—</u>		

## CRITERIA

TIME (Seconds)	TC	GNR
<u>Main Gun Engagements</u>		
From target exposure to start of initial fire command:	<u>—</u>	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>	<u>—</u>
From Gunner "Identify" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From Gunner "Not Identified" to select ammo, lay, track, and lase:	<u>—</u>	<u>—</u>
From TC "Fire" to first round fired:	<u>—</u>	<u>—</u>
From TC completion of lase to first round fired:	<u>—</u>	<u>—</u>
From first round impact to second round fired (if first round miss):	<u>—</u>	or <u>—</u>
<u>.50 Caliber Engagements</u>		
From target exposure to target suppression:	<u>—</u>	<u>—</u>
<u>Coax Engagements</u>		
From target exposure to start of fire command:	<u>—</u>	<u>—</u>
From start of fire command to finish of lay for direction:	<u>—</u>	<u>—</u>
From Gunner "Identify" to select coax, lay, track:	<u>—</u>	<u>—</u>
From finish of tracking to target suppression:	<u>—</u>	<u>—</u>
<u>AIMING ERROR</u>		
<u>Dry Fire-Main Gun</u>	<u>First Round</u>	<u>Second Round</u>
Deflection error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Elevation error from center of mass (Precision):	<u>—</u> mils	<u>—</u> mils
Deflection error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils
Elevation error from base of target (Battlesight):	<u>—</u> mils	<u>—</u> mils
<u>Live Fire-Main Gun, Coax, .50 Caliber</u>	<u>Rounds</u>	
Main Gun	<u>—</u>	
Coax	<u>—</u>	
.50 Caliber	<u>—</u>	